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OUR CONTRIBUTORS

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PROFESSOR BRIGHAM is professor of geology at Colgate University. An appreciation of his geographical work with a bibliography of his writings constitutes the June, 1930, issue of the *Annals of the Association of American Geographers* and marks the occasion of his seventy-fifth birthday. Professor Brigham is a contributing editor of the *Geographical Review*.

PROFESSOR SHAW is in charge of the Division of Soil Technology at the University of California and also of the soil survey and related work for the state. He is keenly interested in the origin and mode of formation of soils, particularly under arid conditions. To the *Geographical Review* he contributed the article "Erosion Pavement" (Oct., 1929), and he was one of the representatives of the American Geographical Society at the Second International Congress of Soil Science held in Russia, 1930.

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RUSSIA AND THE UNITED STATES IN THE WORLD'S WHEAT MARKET

C. F. Marbut

THE AGRICULTURAL CRISIS

THE agricultural crisis in the United States, and to a somewhat less extent in western Europe, has been attracting increasing attention for several years. While it concerns most farmers and most of the products of the farm, it is especially acute among the wheat growers. The production of wheat since the World War has increased to such an extent that world economists are deeply concerned with the problem of finding some use for the growing world surplus rather than with the question, agitating them up to a few years ago, of the source of the world's bread after 1930. In the face of this situation and with the wheat-growing world in its present state of nervous tension over the matter, the influence that will be exerted by Russia in the next few years in the wheat markets of the world is a matter of universal interest. This interest has been reawakened and the nervous tension made more acute through the recent short selling of wheat by the Soviet Government on the Chicago Board of Trade.

Everyone who reads the daily press, even casually, has heard of the Five Year Plan. The following paper deals with the natural conditions in Russia favoring the growing of wheat and discusses the relation of these conditions to the agricultural part of the Plan. The United States and Russia possess vast areas of soils peculiarly fitted for wheat cultivation. Because of the fundamental natural characteristics of these soils the two countries must inevitably come into strong competition in an unrestricted world market. Russia has a potential advantage over this country in the area of first-grade wheat land: there are certain compensations, but this fact of prime importance cannot be neglected in our plans for the future. Russia's

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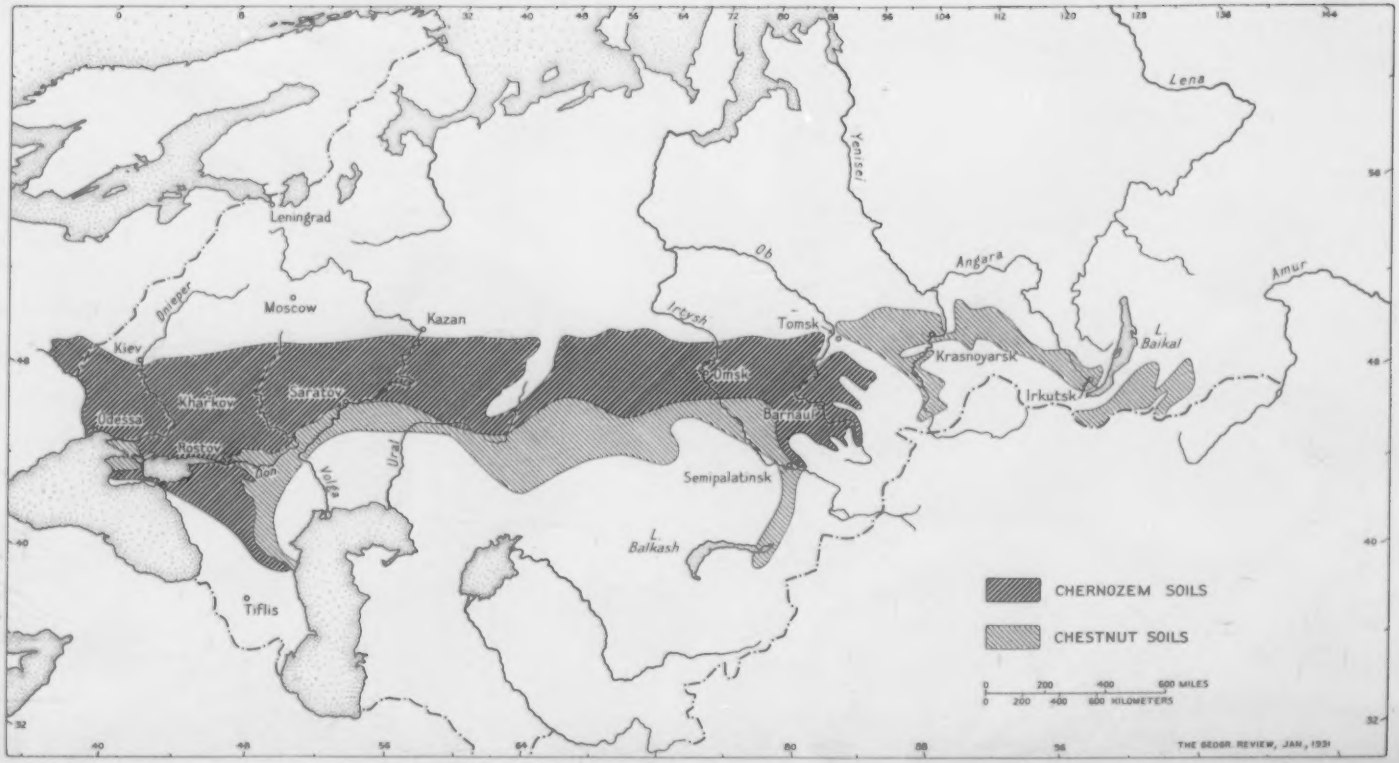
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Saratov
Irkutsk
Odessa
Barnaul
Rostov
Don
Volga
Ural
Semipalatinsk
L. Balkash
Tiflis
CHERNOZEM SOILS
CHESTNUT SOILS
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FIG. 1

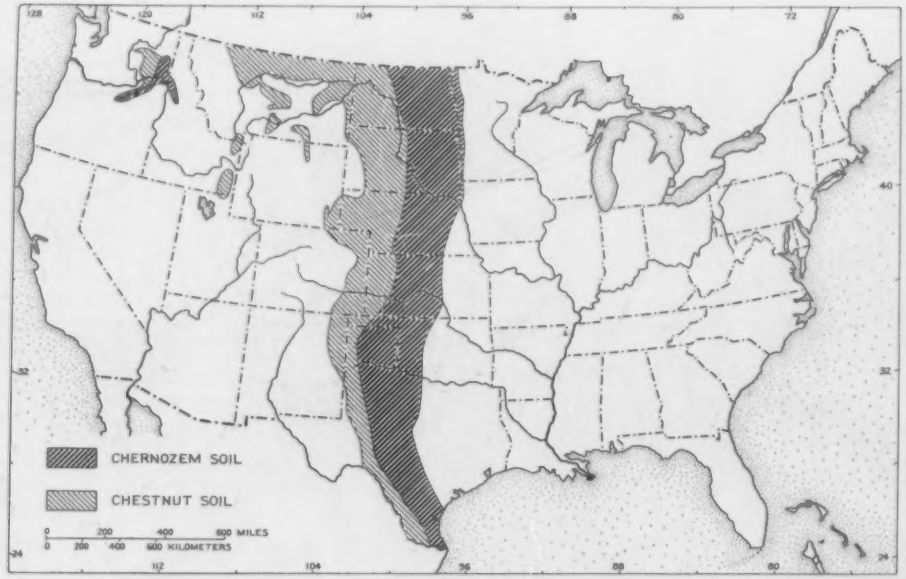

FIG. 2

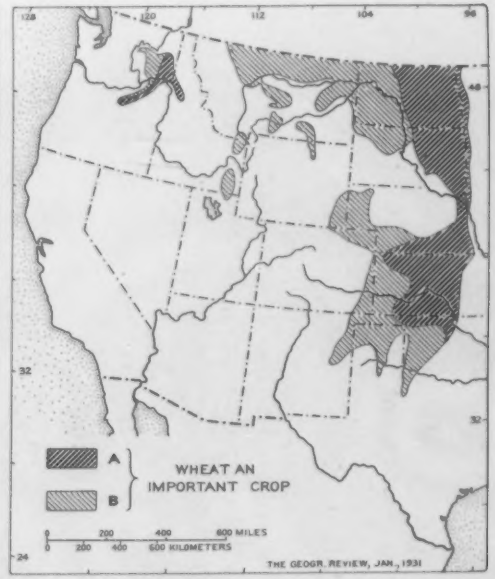

FIG. 3

FIGS. 1, 2, and 3—The belts of chernozem and chestnut soils in Russia and the United States and their relation to wheat production.

Figure 1 shows the general distribution of the belts in Russia. The areas within the belts locally incapable of use for grain are not distinguished. Probably they do not exceed 20 per cent of the area in European Russia and not much more in Siberia.

Figure 2 shows the belts in the United States. Limitations imposed by climate in the south and by locally unsuitable soils in Nebraska and South Dakota are apparent in Figure 3, which shows those parts of the belts where wheat is an important crop. A represents first-grade chernozem soils where wheat is important; B represents chestnut soils and inferior chernozems in which wheat acreage and production are less than in A. For comparative areas see Table I, page 10. Scale of maps approximately 1:36,000,000.

Five Year Plan for the establishment of mechanized state farms, "grain factories," is possible not only because of the desire of the Soviet Government but because of the quality of Russian soils and the amount of available land. If the increased production due to collectivization and mechanization of the peasant holdings—another part of the Plan—takes care of the increasing consumption in the country itself, an assumption not entirely unreasonable, Russia will be able to export 200,000,000 bushels of grain by 1933.

Wheat Soils Before 1875

Before the middle of the nineteenth century the wheat crop of northwestern Europe and America, the most important part of the world market for high-grade wheat, was grown predominantly on the light-colored, relatively unproductive soils and under the influence of a humid climate. These soils, unless well manured, produced a low yield; and with or without manuring the quality of the grain grown, graded according to modern standards, especially those for export grain, was low. The tremendous possibilities for wheat production residing in the great grassland areas of the world were unknown. Low yield and limited area thus account for the pessimistic view of the future bread supply of the world which prevailed up to that time and even later.

Experience in the eastern part of North America showed that wheat did well for a few years on recently cleared forest land but that yields soon declined. This implied that the world's wheat supply was limited by the future supply of virgin soils. Exhaustion of the supply of available virgin lands of this kind, in the climatic zones where wheat growing is possible, could be readily foreseen.

The wheat plant, however, is not naturally adapted to a humid environment. It seems to have developed in a dry climate, one that is usually designated semiarid. Whether that be true or not, it is now well known that a semiarid environment produces a product of very high quality. The yield, with good supply of moisture, is in general larger than in a humid environment unless the soil be well fertilized.

Utilization of Natural Grasslands

The semiarid lands, up to a very few years ago, were occupied by nomads and used very largely for grazing. Their sparse population could consume little, and the general lack of transportation facilities prohibited export. Wheat was grown on such lands on the Mediterranean and Black Sea coasts in ancient times and shipped to Greece and Rome, but the total quantity was small compared with modern demands.

The development of railway transportation during the latter half of the nineteenth century made possible the wider utilization of these lands. This alone, however, would not have effected the change, for a world trade in breadstuffs had not yet become imperative. Two other important movements were simultaneously taking place: the industrial population of the western world was increasing rapidly, and its standard of living was also rising. Furthermore, the invention of agricultural machinery permitted a solution of the labor question. While this was only one of the combination of factors that caused increased production of wheat during this period, yet it was an essential one, for with the old sources of power available men could not have produced enough wheat to supply the increasing demand.

Natural Characteristics of the Grasslands

That the areas of the grasslands were large and that they were still in virgin condition were, however, not the only important facts. The characteristics of soil, climate, relief, and natural vegetation were equally important. The grassland soils are rich in all the constituents usually designated as plant foods, such as nitrogen, potash, phosphoric acid, and lime.

The humid land forest soils are fertile, chemically so, when first cleared of forests; but the layer containing a high percentage of the constituents of fertility is very thin and is soon exhausted. The soils of the semiarid lands are entirely different in this respect. Not only is the percentage of what we may call fertility constituents large, but the layer in which they are present is thick. Its thickness in feet is as great as is the corresponding layer in the humid forest soils in inches. It is so great that the world's experience up to the present time affords no basis for placing any estimate on the duration of the productivity of these lands.

The great grassland areas lie in the interiors of the great continental areas of the temperate zones and have smoother relief, taken as a whole, than the lands of humid regions. Not only does this make transportation relatively easy and cheap but, what is much more important, it permits the use of agricultural machinery. This condition is an absolute requirement for the establishment of "grain factories" making it possible to organize production on an industrial or mechanical basis. In their natural condition these lands are treeless and require nothing but the plow and other agricultural machinery to place them in cultivation. The relatively dry climate also is a factor of great importance in large-scale farming.

World demand and local conditions combine to make grain production, on a very large scale, easy and the cost per unit of product low. It may well be questioned whether history has recorded any

such perfect adjustment of demand to the natural and artificial conditions for satisfying it.

Shifting of Wheat Production

The inevitable result of all these circumstances has been the shifting, during the last half to three quarters of a century, of commercial wheat production from the historic agricultural region of western Europe with its poor soils, humid climate, low yield, and poor quality of wheat to the great grassland areas of the world. Wheat is still produced in the humid regions, though in proportionally reduced acreage, especially in the United States and England; but it is produced largely for local consumption or at least for an internal market. The competition in the world's wheat market which has brought the price of wheat to so low a figure recently is a competition of grain produced mainly on the grassland areas.

The countries of the world in which large areas of these lands occur, in the order of their importance are: Russia, United States, Canada, Argentina, Hungary, Australia, Rumania, Bulgaria, Greece, and small areas in other countries. The Hungarian, Rumanian, and Bulgarian areas may be considered as more or less isolated southwestward extensions of the Russian area. It is practically certain that considerable areas occur in North Africa, and lands of somewhat similar character may occur elsewhere in Africa.

Wheat from practically all these countries enters the international market, but since this paper is concerned primarily with the United States and Russia the rest may here be neglected. Canada, Argentina, Australia, Hungary, and Rumania are all important producers of high-grade wheat. With the exception of Canada, however, the production in none of them will increase greatly in the near future, and under existing conditions little increase may be expected even from Canada.

Occurrence of the Wheat Lands

The soils of the wheat belts range from black to dark brown, are unleached, rarely contain salts sufficiently concentrated to injure crops, and have a structure highly favorable to plant growth except locally; but the range in texture may be wide. In general they may be described as the most productive soils, as soils, in the world.

They occur predominantly in great continuous belts, the direction across the continents taken by them as well as their width depending on the distribution of climatic, especially rainfall, and vegetational features. Given smooth relief, the development of the soils in these great belts has been brought about by the two dynamic factors of climate and natural vegetation. The latter may itself be considered

as the product of the climate; but in turn it exerts a very strong influence on the soil—an influence even greater, probably, than that exerted by the climate.

In Eurasia these lands occupy a belt extending approximately from the Danube River on the western boundary of Rumania to Lake Baikal in Siberia, with an outlier of considerable size east of the lake and several isolated areas west of the boundary in Europe. The distance from the western boundary of Rumania to Lake Baikal in a straight line is about 3600 miles. The width of the belt, including only the land that will grow wheat with moderate success, averages a little more than 200 miles.

In North America the belt is continuous from the Gulf of Mexico in the vicinity of Corpus Christi, Tex., to Edmonton, Canada, with an outlier farther north in the Peace River country. The part of the belt in which wheat can be grown extends from the vicinity of Plainview, Tex., to the Peace River country.

The length of the belt from Plainview, Tex., to Edmonton is about 1750 miles, and that part of it lying south of the international boundary and within the United States is about 1000 miles long. Its width within the United States ranges within considerable limits, being especially great at its northern end, but south of the latitude of northern South Dakota it is about 200 miles, or about that of the Russian belt.

Figure 1 shows the general distribution of the belt in Russia. On the basis of soil character and corresponding climatic features it is divided into two regions of first and second class soils respectively. The soils of the first region consist of what are now known throughout the world as chernozem soils. Those of the second class are equally well known as brown or chestnut-brown soils. The chernozems are black soils and of such chemical and mechanical composition and structure as to make them highly productive. They have developed in a region with a rainfall from 16 to 20 inches a year. The moisture supply is therefore such as to render crop failures possible but not frequent.

The chestnut-brown soils are like the chernozems in most characteristics except the color of the surface layer: they are lighter and have a lower percentage of organic matter and nitrogen. They are naturally less fertile and occur in a region with a lower rainfall. Crop failures in this belt are more frequent than in the chernozem belt, and yields in normal years are less.

The number of square miles in the Russian belt, obtained by a planimeter used on the original drawing prepared for Figure 1, is 754,000 square miles for the chernozem and 581,160 square miles for the chestnut-brown soils. While it is well known that the surface relief within each division of the belt is in general smooth, it is not

universally so; but the proportions of rough and smooth land are not known. The extent of the areas with soils not capable of use for grain growing, such as very sandy or very stony soils, is not known, though probably it does not amount to more than 20 per cent of the total area in European Russia and not much more in the Siberian part of the belt.

The east-west trend of the belt and the very slight differences in elevation indicate that the differences in temperature are small. The evident uniformity of temperature, rainfall, and soils and the occurrence in a region of great smooth plains all combine to produce a belt of uniform characteristics and capacities.

In the United States the north-south trend of the belt brings the important consequence of rather widely different temperatures in its various parts. The southern end lies within a region of prevailingly high temperature; the northern part, where it crosses the international boundary, is one of low annual temperature though the summers are warm. The wheat plant is a cool climate plant, and the southern end of the belt extends south of the wheat-growing limit (Figs. 2 and 3). In addition to the main belt a subordinate belt lies in eastern Washington and adjacent parts of Idaho and Oregon. There is also an expansion of the chestnut-brown part of the belt in Montana. The occurrence of small areas and narrow strips of identical soils in many parts of the mountains of the West is paralleled in the case of the Russian region by areas of the same soils along the lower slopes of the great mountain ranges that lie along the southern and eastern sides of Turkestan and elsewhere. These are not shown on the Russian map because they will grow wheat for the local Turkestan population only.

Prevailing annual temperature has been a relatively unimportant factor in determining the characteristics of these soils, but this paper is concerned less with the soils as such than with them as wheat producers, and the prevailing temperature of a region is highly important in wheat production. To what extent the practical absence of wheat growing in the chernozem belt of the United States south of Plainview, Tex., is a function of the temperature rather than of other factors need not be discussed here. The fact that it is not and has never been an important crop south of this line is sufficient for our present purpose. All our information, though far from complete, leads to the conclusion that in Russia the whole belt is equally productive for wheat, aside from local variations in relief and texture of the soil, from one end to the other. In the United States this is not true.

The total area of the entire chernozem belt of the United States is 277,600 square miles; that of the chestnut-brown belt is 251,700 square miles. The corresponding figure for the area of that part of the chernozem belt on which wheat is the dominant crop and a small

strip of the prairies immediately east of the chernozem boundary in Nebraska and Kansas in which hard wheat production is relatively important is 154,778 square miles. This includes a small area in southwestern Nebraska and northwestern Kansas west of the general chernozem boundary where wheat acreage is large.

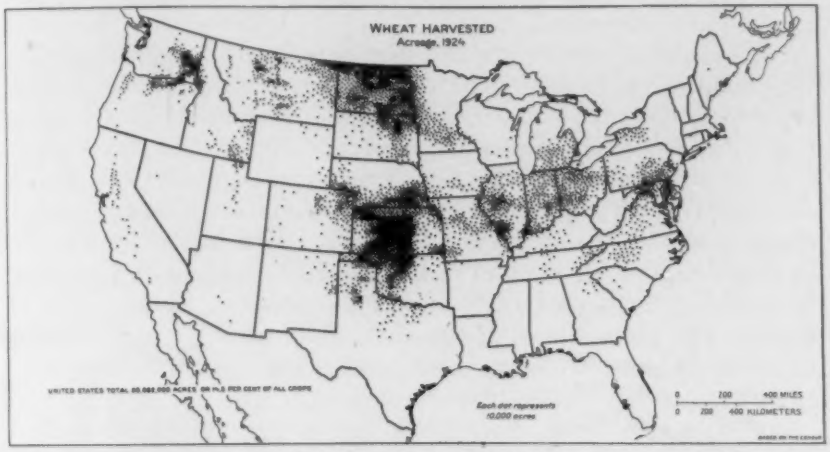

FIG. 4—The actual distribution of the wheat crop of the United States. Compare Figure 3. (Bureau of Agricultural Economics, U. S. Department of Agriculture.)

The area of chestnut-brown soils in which wheat is relatively important, including also part of the southern chernozem belt in Texas where wheat is of relatively little importance, is 211,700 square miles.

This disadvantage of the United States as compared with Russia is partly compensated for by another important difference in the fundamental characteristics of the two countries. In Russia the belt of chernozem and chestnut-brown soils constitutes the only wheat-producing area the country has. The northern boundary of this belt is the northern boundary of the wheat-producing area; the southern boundary is practically as sharp.

In the United States, however, a large area east of the chernozem-chestnut belt produces wheat and, furthermore, wheat of approximately the same grade as that produced in the southern half of the chernozem-chestnut belt. While the greater part of the wheat of this region grades as soft winter, a considerable part of it grown in Iowa, eastern Nebraska, and adjacent parts of Missouri and Kansas, and in parts of Illinois is graded as hard red winter wheat, the same kind as that produced in the Kansas, Oklahoma, Texas, and some of the Nebraska parts of the chernozem-chestnut belt.

This fact, however, does not carry as much weight as it might suggest. The region is not one in which wheat must be grown. It is not one in which the substitution of other crops, even crops of

commercial value directly or indirectly through live stock, is difficult. It differs profoundly from the chernozem-chestnut belt in this respect since the latter is one in which the growth of other crops than wheat or barley is difficult. The latter is a wheat-barley region and because of its fundamental natural character is limited, like the corresponding Russian belt, in the range of its adaptabilities; and hence the inevitable competition between the two.

It has already been remarked that the map of the distribution of the chernozem and chestnut soils in Russia (Fig. 1) does not show the area of unusable land within the belts. The map Figure 3 shows in a general way and Figure 4 more accurately a large part of both belts in Nebraska and South Dakota in which little wheat is grown. In Nebraska with a narrow fringe extending into South Dakota, this area consists of sand; the northern part, in South Dakota, consists of very heavy clay, too heavy to be used economically for wheat production. That part lying east of the Missouri River in South Dakota and northeastern Nebraska is potential wheat land, but it is also rather productive corn land; and, because of the greater value of that crop, wheat becomes relatively unimportant.

In matter of detail, our existing knowledge does not permit us to do more than to assume that the arable proportions of the corresponding belts in the two countries, after eliminating the Sand Hills and western South Dakota, are about the same. Detailed surveys have not been made of either. Considerable knowledge regarding the detailed nature of the American belt has been accumulated, but no attempt has been made to put it together and express it quantitatively. On a later page some figures regarding the percentage of the total area of unoccupied land in parts of this belt in Russia will be given, but at this point the two areas must be compared as just indicated.

The areas of the Russian belt, divided into the two classes of land, black and dark brown, or, in terms of productivity, first-grade and second-grade lands, and that of that part of the American belt in which wheat is the main or at least an important crop are shown in Table I.

TABLE I—COMPARATIVE AREAS OF WHEAT LAND IN RUSSIA AND THE UNITED STATES

	Square Miles	*Acres*
The United States		
Chernozem (first-grade land)	154,778	99,057,920
Chestnut soils and inferior chernozem	211,700	135,488,000
Russia		
Chernozem*	754,000	482,560,000
Chestnut soils and inferior chernozem	581,160	371,943,040

*Russian estimates give about 900,000 square miles. This includes mountain border areas in Turkestan and areas between Krasnoyarsk and Lake Baikal and east of the lake, all containing a considerable proportion of rough land. In Figure I the two latter are shown as chestnut and inferior chernozem.

A glance at the table shows the great difference in the respective areas of wheat land in the two countries, the difference being greatest between areas of first-grade land. In this matter Russia has a potential advantage that cannot be ignored by the United States.

Relation to Transportation

In addition to the natural factors affecting production, consideration must be given to those affecting transportation. Navigable rivers or other bodies of water and their geographic relations to the producing areas are highly important factors in agricultural competition. In this respect a comparison of the chernozem-chestnut belts in Russia and the United States brings out some striking differences. That part of the wheat-producing belt in the United States lying nearest to tidewater, the extreme southern end, is almost 500 miles distant, while the distance by rail is somewhat greater. That part of the belt in which most of the export wheat is produced lies more than 600 miles from tidewater and at least 500 miles from the nearest navigable river. The belt is not crossed by any stream now navigable, and all grain is shipped from it by rail.

The western end of the Russian belt lies on the Black Sea. The penetration of tidewater through the Mediterranean Sea and its extension into the very heart of the Eurasian Continent is of extremely great importance in this connection. In addition, the western and broadest part of the chernozem-chestnut belt in Russia is crossed by three great rivers navigable for considerable distances. The largest, the Volga, crosses the entire width of the belt. The navigation of the Dnieper is now being made much easier by the building of the great dam and locks at Dnieperstroy. The Asiatic part of the belt, about half of the entire belt or possibly more, is less favorably situated with respect to transportation. It lies a long distance from the sea and is not crossed by navigable rivers leading to other than the Arctic Ocean. The distance by sea from Black Sea ports to the markets of western Europe is no greater than that from the Atlantic or Gulf ports of the United States.

In so far as the character of the regions affects the cost of railway building and operation the belts in the two countries seem to be much alike in their characteristics.

The Social Possibilities

The presence of a large area of land does not necessarily mean that it is used or that if used in a different way than formerly that production will be increased. Such a result can take place only if land formerly in cultivation be cultivated more effectively, or hitherto

uncultivated land be brought into cultivation, or both. Realization will depend on what may be designated as natural possibilities on the one hand and social possibilities on the other. The former have already been discussed; we may now examine the latter.

The economic conditions existing in Russia at the present time make greatly increased production desirable, and this desire is reinforced by the effort of the whole country to work out the Five Year Plan. That cannot be done without foreign credits, and the only means available to the government to obtain these is through exports of Russian products. If grain exports can be greatly increased, credits can be obtained.

The prevailing unsatisfactory food conditions among the masses of the population before the war are universally well known. The quality on the basis of modern requirements was poor, and the quantity was often short. This being the case it may well be true that the desire to establish credits in foreign countries is not the only reason for the devotion of an important part of the Five Year Plan to the increase of grain production. Whatever may be the reason or reasons, the significant fact for the United States is the important place which increase in wheat production occupies in the Plan. Two important features of the Plan are concerned in this matter constituting two methods of effecting the increase. The first is by collectivization of peasant holdings, the second by the establishment of great grain farms operated by the state on hitherto unoccupied land.

Before the World War Russia was an exporter of grain, the amount reaching a maximum of about 165,000,000 bushels.[1] From the time of the outbreak of the revolution up to 1927, there was practically no export from the country. It is well known that the wheat produced for export before the war came from the great landed estates. The peasant was too poor to buy the surplus grain from the landlord and was compelled to live on other and cheaper foods. After the large estates were broken up and the peasant was given the land he consumed the wheat himself and did not sell even enough to supply the Russian cities. Decreased production was accompanied by increased domestic consumption. In 1927 about 26,000,000 bushels were exported. Production fell off again in 1928 and 1929 to such an extent that nothing was left for export. In 1930 export has again been resumed.

Collectivization of Peasant Holdings

The fundamental thought underlying the Five Year Plan is the mechanization of all production. Mechanized production necessarily means large-scale production and when applied to agriculture

[1]The World Wheat Outlook, 1930, *U. S. Dept. of Agric., Miscellaneous Publ. No. 95*, Washington, 1930, p. 25.

FIG. 5

FIG. 6

FIG. 7

FIG. 5—Plain of the Salek region, north of the Caucasus and east of Rostov-on-Don.
FIG. 6—Saratov Experiment Station grounds.
FIG. 7—The steppes 100 miles southwest of Saratov.

means large-area agriculture. Large-scale agriculture is in general not possible except on the basis of large area. The carrying out of the agricultural part of the Five Year Plan cannot be accomplished on the basis of the individual peasant holding. The only way in which it can be applied there is by combining a number of the holdings into one great farm and supplying machinery for cultivating as a unit. This is being done on a very large area and will probably be extended as rapidly as machinery can be made available. The details of mechanization of peasant farms are not a matter with which this paper is concerned.

The paradox in the whole Russian situation is that the Soviet Government constitutes the first attempt to apply Marxism, a system developed in the environment of an intensely developed industrial country and based on conditions derived from such a system, to a country where nearly 80 per cent of the total population is agricultural and has the agricultural individualistic point of view. Of all the countries of the western world, Russia seems the one to which such a system is least applicable. This fact has been the source of many difficulties, and from it have arisen many problems. Only since collectivization of peasant farms began has any attempt been made to communize the greatest of all Russia's industries and the great masses of the Russian people.[2]

According to the Soviet authorities the expected increase in both yield per acre and total production on collectivized land is based on the better preparation of the seed bed by the modern machines and implements supplied to the collectivized villages by the government, the better timing of the seeding due to expert advice furnished also by the government but paid for by the peasants, better seed, and less loss in harvesting. The plan in short is to modernize the agriculture on these lands. Before the war the methods and results did not differ much from those prevailing throughout Europe during the Middle Ages. Since the war, the subdivision of the land of the large estates in small tracts, probably with other reasons, has made the application of modern methods impossible.

Mechanized State Farms, "Grain Factories"

The other means for increasing wheat production, that of the great state farms, requires the existence of unoccupied land in the first instance.

[2] Note should be made of a fact called to the writer's attention by Dr. J. S. Joffe of the New Jersey Agricultural College. The great pre-war estates covered a much larger proportion of the wheat-growing region than of the northern part of the country. On these estates a periodic redistribution of the land of the village took place. So far as the peasant was concerned the land was to be regarded as common land rather than as individual holdings. This familiarization with the idea underlying collectivization will facilitate the spread of collectivization over the wheat-growing region. The greater part of the resistance to collectivization comes from the peasants in northern Russia.

The wheat produced by Russia before the war seems to have been produced on a smaller acreage than that in cultivation in 1930. On the basis of all the information obtainable on the ground, all the land in the wheat belt abandoned during and after the war has again been occupied and is again in crops. In addition to that, considerable areas of unoccupied prairie land in European Russia have now been colonized. This applies especially to considerable areas in the better grade of chestnut soils in the Ukraine and the northern Crimea taken up by Jewish colonists since 1921 and also to considerable areas of fair to good chernozem in the region to the west of Saratov. There are probably more than a million hectares of high-grade chernozem in the territory of the northern Caucasus east of Rostov still in virgin condition except about 125,000 hectares that have been included in state farms during 1929 and 1930. There is no important area of virgin unoccupied chernozem land, other than those just mentioned, still existing in European Russia. A total of ten to twelve million acres of grain land is said to be still available, but by far the greater part of it consists of chestnut soils along both sides of the Volga below Saratov and southwest of Stalingrad. Yields in this region are apt to be lower than the grade of soil alone would suggest on account of the prevalence of desert winds from the east carrying salty dust.

The entire Russian system from the government to its industries is an experiment, but its interest to the rest of the world lies as much or more in the immense scale on which it is being carried than in its character as an experiment. This applies to the size of the state farms contemplated in the Five Year Plan to an even greater extent than to the other activities carried on in the country, even that of the government itself. Other governments covering as large a territory as that of the Soviet Government have existed; but no farms, whether organized and operated by the state or by private individuals, have ever covered so large an area as those contemplated in the Russian Plan, some of which are actually in operation.

Assuming, without discussion, the success in a measure of that part of the Five Year Plan concerned with agriculture, it may be assumed also that the collectivized peasant farms will probably increase materially the total production of grain. On the same assumption, the production by the state farms, when all or any considerable part of the contemplated number are in operation, will be many times greater.

The government of the Soviet Union on the first of August of 1928 decreed the creation of a number of these farms. Commissions were organized for the purpose of selecting localities where natural conditions were favorable. It was imperative that highly favorable localities be selected for the first farms. While an attempt to produce farm crops on a modern factory basis by complete mechanization was not entirely new, the Campbell farm in the United States (Hardin,

Montana) having been in existence for several years, yet the scale on which it was to be carried out surpassed by far any previous attempt, so that no mistake could be made in the selection of the land. Trained scientific men were sent out to study in considerable detail the areas which appeared, on the basis of existing geographical knowledge, to be most suitable.

The Five Year Plan contemplates the establishment of a rather large number of state farms providing for a wide range of crops and live-stock industries. On the basis of studies made up to the early summer of 1930 a total area of 75,000,000 acres seems to be available for large state farms. This covers all Russia including the great northern timbered region where wheat is not grown, the desert, the mountain border country of Turkestan, where small areas are still available, as well as the great grain belt. The grain farms organized or definitely planned cover an area of about 25,000,000[3] acres located partly in European and partly in Asiatic Russia.

Natural Bases of Mechanized Farming

The possibility of the development of great "factories" for the production of agricultural crops other than grass or pasture is not entirely a matter for the simple determination of a government or of a group of capitalists. Probably the most fundamental condition underlying a modern factory of any kind, one that is so fundamental and evident that it is always assumed without mention, is the establishment of proper foundations on which machines may stand and work. In a manufacturing plant this is the product of engineering. Whatever the "lay of the land" may have been in its natural condition, it is changed to suit the absolute requirements of the particular machinery.

A plant for the production of agricultural crops cannot operate on an artificially prepared foundation. Man must accept what nature has prepared for him. In the establishment of such a plant, therefore, the geographer must take the place of the foundation engineer in the building of a manufacturing plant. The geographer selects the area where *natural conditions* permit employment of the machines that must be used in the operation of a great crop-production factory. Crop production is necessarily geographic. It covers an area, and any extension must occupy more area rather than another story. It grows horizontally rather than vertically. With the existing types of crop-producing machinery and probably with any kind that may in the future be produced its operation on such a scale as to make a "grain factory" possible is limited to land with a narrow range in topographic and soil characteristics.

[3] J. Anissimoff: Soviet Farms and Specialization in Agriculture, Lenin Acad. of Agric. Sci., Moscow, 1930.

FIG. 8

FIG. 9

FIG. 10

FIG. 8—Seeding on the "Giant Farm," east of Rostov. (Official Russian Photograph.)
FIG. 9—Soy beans on the "Giant."
FIG. 10—Village on the Verblud farm east of Rostov.

To whatever extent organization based on experience may make it possible to disregard in the future the conditions imposed by nature, it is apparent that at present such factories are possible only on smooth land, preferably virgin and unoccupied, with soils naturally productive for the crops to be grown, and in a climate that offers a minimum of interruption to the operation of the machines. A roof cannot be built over a "grain factory." It has been explained already that conditions of this kind are encountered practically exclusively in the interiors of the great continental areas. They constitute the great grassland plains of the world, so that the establishment and operation of such farms in Russia is possible not merely because of the desire of the Soviet Government but because of the land itself. Such farms could not be operated in western Europe, however much they might be desired by a western European government.

Areas Available for State Farms

On the basis of the information that had been accumulated by the experts charged with the duty of finding suitable land for state farms up to the spring of 1930 it was concluded that about 30,000,000 hectares, or 75,000,000 acres, were available. This is necessarily a preliminary estimate and includes the total area for all kinds of state farms, not merely those devoted to the production of wheat. The land lying outside the chernozem-chestnut belt, amounting to about 10,000,000 acres, may be eliminated from consideration here, since it is not in the wheat-growing region. A number of small areas have been located in the mountain borders of Turkestan and in the region of gray soils north of the Turkestan desert. These may be eliminated because of the small areas in each unit, because of the very poor soil in some of them, and because also they are being established mainly to produce bread grains for the dense population of the irrigated regions of Turkestan so that more irrigated land may be released for cotton production. These cover an apparent total of not less than 3,000,000 acres. This would leave available about 60,000,000 acres within the region where high-grade export wheat may be grown. It is impossible to determine how much of this lies within the chernozem region and how much in the brown soil belt; but rough estimates made by the experts place about 65 per cent of it in the former and 35 per cent in the latter region.

Russia is a country, however, in which naturally productive soils are confined almost entirely to the semiarid region, or the region of high-quality wheat production. North of this belt the soils are much like those in the Great Lakes region of the United States; and south of it, except locally, is desert or mountains. While it is apparent that in Russia the soils of the semiarid belt are of somewhat higher natural

productivity than the greater part of the soils of the United States in corresponding situations, yet she seems to lack soils of intermediate productivity which cover so large an area in the United States east of the chernozem-chestnut belt.

The Russian soils approaching nearest the latter in productivity are those lying along the northern part of the European section of the chernozem belt. These approach more nearly the characteristics of American corn belt soils than any other soils in Russia, but they are not identical. The northern part of the country is a rye, oats, grass region in the main, the rest either a natural wheat country or a desert. A great country demands a much wider range of products than those mentioned. Some of these are being produced in the irrigated region of Turkestan and the southern Caucasus; but the area of such land is very small, and much of it sorely needed for cotton production.

The northern part of the chernozem belt in the Ukraine, parts of the north Caucasus country, and the Black Sea coast in the Crimea and westward, in all of which the rainfall is higher than in the central chernozem region, constitute the best available land in European Russia for the growth of a number of important crops that demand a productive soil and a moderate to relatively high moisture supply. These crops consist mainly of sugar beets, hemp, soy beans, sunflowers (for oil), and fruit. Most of these crops constitute raw materials needed for Russian industries.

The area recently set aside by the government for these crops is potential wheat land; yet the rainfall is higher than is absolutely required for that crop, so that wheat production can be replaced in part by these and other crops. Wheat will not be excluded from it but will constitute a rotation crop rather than an exclusive one.

The acreage requirements for these crops will, according to the latest information obtainable, reduce the acreage available for great state grain farms or factories to about 25,000,000. It is probable, although exact information on that point is not yet available, that half of this acreage will lie in the chernozem belt, the rest in the chestnut-brown belt. The most recent information indicates, however, that the area of available unoccupied high-grade wheat land, especially in Siberia, may be considerably greater than that given. It is reliably reported that recent exploration in the chernozem and in the best parts of the chestnut-brown belts of Siberia has revealed several large, smooth plateau areas practically unoccupied, in some cases covering an area rather more than 150 miles in length and 50 miles in width. They have remained unoccupied up to the present time because of the absence of a water supply available to the peasant colonist with his small amount of capital. The demonstrated facts are that the available acreage is large, with possibilities that it is still larger than the figure given above (25,000,000 acres).

The average acreage of good soil is only one of the possible factors of production. Unless it is used it is of no actual value. Whether the available land in Russia will be utilized in the near future is a matter about which different individuals may have different opinions. The whole Russian experiment is new and entirely different from anything ever attempted before. A brief description of what has actually been done so far in carrying out that part of the Five Year Plan concerned with the production of grain on the state farms will give some idea of what may possibly be expected in the future.

The Giant and Verblud Farms

The state farms of all kinds already planned and in part actually organized cover a total area of about 75,000,000 acres, of which those controlled by the Grain Trust cover about 25,000,000 acres. About 2,500,000 acres were in grain in 1930. A report has already been made regarding the yield on two of these—the largest of all, the "Giant," situated a few miles from Salsk southeast of Rostov-on-the-Don, and Verblud, in the same region but nearer Rostov. The Giant contains 427,000 acres, or about 667 square miles. On this farm about 280,000 acres were in grain in 1930. The crop was good and was all harvested in good condition. A total of 3,865,000 bushels of grain was produced, the yield amounting to a little more than 14 bushels per acre. In 1929, the first year of operation, about 150,000 acres were in grain. The crop was injured by drought, but a total of 1,830,000 bushels was produced, a yield of about 12 bushels per acre. The figure given for the yield of 1930 is a very conservative one and is taken from an article by Louis Fischer in *The Nation* of October 8, 1930. The farm was visited by the writer of this paper in August after the harvest had been almost completed, and on the basis of the appearance of the unharvested portion the yield would have been estimated at about 18 bushels. The cost per bushel, according to the government report, was about 80 cents on the Giant in 1929. That on Verblud farm in 1930, according to Fischer, was about 75 cents. The cost on the Giant in 1930 is not known, but the official estimate was about 50 cents per bushel. This was based on an estimated production of 3,300,000 bushels. Actual production was somewhat more than the estimate.

The total area included in the state grain farms as now planned and in various stages of organization when in cultivation will produce, at the low yield on the Giant in 1929 of 12 bushels per acre, a total of 300,000,000 bushels. The Plan contemplates the operation of this total acreage by the end of the five years of the Plan, in 1933. While the execution of the agricultural part of the plan is now ahead of schedule, it will not necessarily remain so to the end. It makes

very little difference, however, whether it does or not. A delay of another period of five years in the completion would make very little difference from the point of view of world conditions. The possible production on the total area at 12 bushels per acre is disturbingly large. In some years, years of favorable weather conditions, the yield on those located on first-grade soil will be, for the first few years after breaking, before the weed and disease problems arise, considerably more than 12 bushels per acre. At this moment it is not possible to state how many will be so located, since the exact location of these farms cannot yet be obtained in this country.

Assuming that nothing interferes with the carrying out of the Plan, it is apparent, as was stated at the beginning of this paper, that Russia will have for export in 1933 more than 200,000,000 bushels of wheat. Allowing for all eventualities that seem to be reasonably justified, it may be safely assumed that she will be able to export in that year more than the maximum amount exported in any year before the war.

JORDAN COUNTRY

Isaiah Bowman

NOTHING could be further from the truth than the oft-repeated statement that there is no longer an American "frontier." The error had its origin in a four-line statement in a report of the United States Bureau of the Census for 1890: "Up to and including 1880 the country had a frontier of settlement, but at present the unsettled area has been so broken into by isolated bodies of settlement that there can hardly be said to be a frontier line. In the discussion of its extent and its westward movement it can not, therefore, any longer have a place in the census reports."[1] In other words, the rather definite "line" that marked the border of advancing settlement was said no longer to have that marked continuity which it had long displayed. Quite wrongly, later commentators have taken this to mean that frontier conditions had passed and that the years immediately preceding 1890 marked the end of pioneering.

The Permanent Border

As a matter of fact, frontier living is still the rule, not in one community but in scores of communities, not in isolated districts but throughout a thousand-mile belt of territory. This conclusion is reached after summer field studies in 1921 and 1930, including a traverse of several thousand miles through selected regions in the West. The details will be clearer if we keep in mind a few generalities. It is one of the outstanding characteristics of a frontier or pioneering people that they live a life of experiment. Instead of doing the same thing in much the same way from year to year and stabilizing its life to correspond with a settled agricultural practice, the frontier community is in a state of unsettlement. With unending change in strongly accented climatic and economic conditions an entire region may not be able to cease experimentation. The pioneering type of life then becomes not a stage of development but an ultimate result.

We have only to look at a land-classification map of the Jordan country, Montana (Fig. 1), to see how peculiarly scattered are the contrasting types of land upon which a farming and ranching population gains a living. This is largely due to differences in the waterholding capacity and fertility of the soil. The possible combinations of good

[1] Compendium of the Eleventh Census: 1890, Part I: Population, Washington, 1892, p. xlviii. It was also alleged in the same report that the country west of the 99th meridian had a rainfall "insufficient for the needs of agriculture, and irrigation is necessary for the cultivation of the soil" (p. lviii).

and poor soil, and therefore of farming and ranching use, are almost endless. Add a marked rainfall variability from year to year, and we see how varied the land composition of individual farms or ranches may become. A map of rainfall variability[2] reveals the unlikeness of the region to the more humid eastern portions of the country. Not only are the grasslands on the western border of the plains country in a climatically dry region, they are in a climatically variable region. They are in the grip of a general law, that the drier the climate the less dependable the rainfall. It is not true that deserts are always dry. What makes them undesirable for most humans is that one cannot depend upon their being wet.

The marginal belts of light rainfall, where farming is barely possible, are the regions of greatest agricultural insecurity. Good and bad crop years alternate year by year or by groups of years, and so far they have been unpredictable. How far one can go in reaping the bounty of the land and yet escape the penalties of drought is the perennial question of the dry-farming and farming-ranching country of the West. The homesteaders of one period go in and, after trial and defeat, let the land grow up again to sagebrush. In common with the whole "troop of living creatures," they have felt the remorselessness of drought. "This is our earth, most friendly earth and fair," was written for quite another rainfall zone. The second generation of homesteaders in dry-farming country comes in with a new agricultural technique and, with some guiding experience from tenacious old-timers, succeeds where the earlier generation failed. All goes well until dry years and a drop in the market price of wheat and cattle compel a change in the size of holdings or a change in the balance between grain and stock or both, and after an exodus from the poorer or drier soils the region once more comes into a state of temporary stability. Like all marginal areas, the western dry-farming and ranching communities are the first to feel depressions in the economic system of which they are a part.

The permanent border type of land and people is as definite in its expression as the corn-belt type or the cotton-belt type. Wide and profound shifts in the border of settlement or in the density of population or in the systems of tillage or in the outlook are characteristics of the type. This was never so apparent as today, with the rapid extension of wheat cultivation following the high prices that prevailed after the World War. The map (Fig. 3) shows the increase of land in crops in the United States between 1919 and 1924. The western border of the wheat country had a striking increase of crop land in contrast to the diminishing acreages farther east. The increase has been maintained in the face of a declining market, the lower

[2] See for example, the map by Erwin Biel, "Die Veränderlichkeit der Jahressumme der Niederschläge auf der Erde," *Geogr. Jahresbericht aus Osterreich*, Vol. 14–15, 1929, Plate 21.

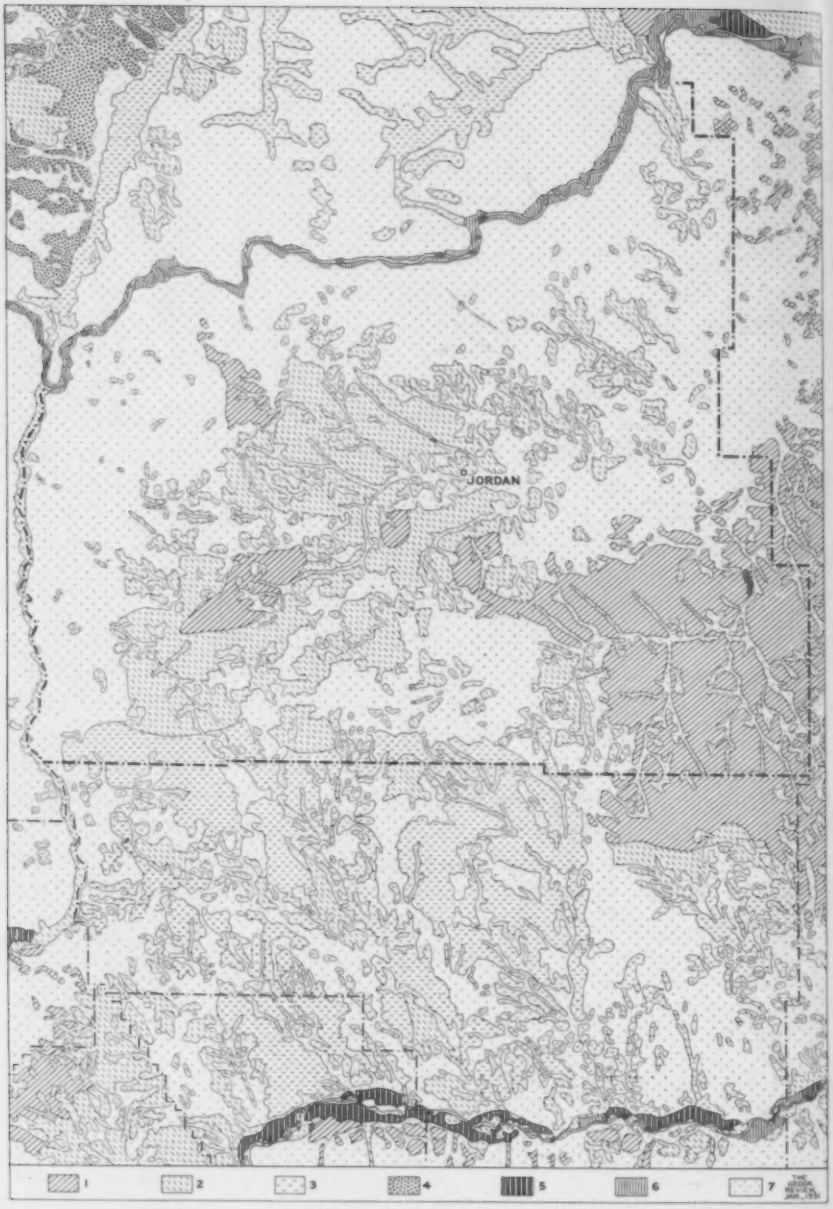

FIG. 1—Land classification map of the Jordan country based on the U. S. Geological Survey's land classification maps of the Northern Great Plains (scale 1:500,000). The scale of the map is 1:1,135,000. Numbers have reference: 1, farming-grazing land (crop failures in dry years); 2, grazing-forage land (grain crop failures except in good years); 3, grazing land (tillage unsuccessful because of poor soil or very low rainfall); 4, stony land; 5, irrigated land; 6, Missouri River bottom land; 7, nontillable grazing land.

FIG. 2—Location map of the Jordan country, the area shown in Figure 1. All of the localities in Garfield County marked on the U. S. Geological Survey's land classification map are shown here. The county, which has an area of 5000 square miles, had a population of 4250 and 1073 farms in 1930 (preliminary figures.)

price of wheat stimulating production instead of halting it, a process paralleled in Australia in the past few years. A thorough-going machine technique, applied to virgin soil held in large units purchased at low prices, does not shrink because the market price of wheat is low. It beats the game, at least in selected regions, by employing more intensively the tools and stimulating the very conditions that brought about the crisis!

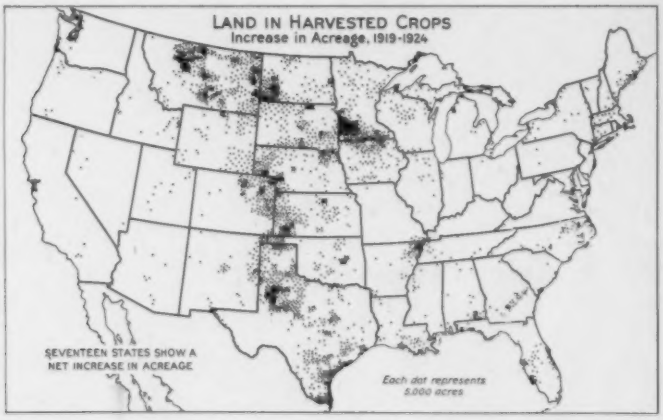
LAND IN HARVESTED CROPS
Increase in Acreage, 1919-1924
SEVENTEEN STATES SHOW A NET INCREASE IN ACREAGE
Each dot represents 5,000 acres

FIG. 3—The increase in crop acreage harvested in 1924, as compared with 1919, was mostly in the level, or gently rolling portions of the United States, where, despite the subhumid to semiarid climate and low prices for farm products, the use of modern machinery, by increasing the area a man can cultivate, has made crop production profitable. (Bureau of Agricultural Economics, U. S. Department of Agriculture.)

NINETY MILES FROM A RAILWAY

In support of the argument of this paper I shall draw illustrations from a wide area of western land; but, because both argument and illustrations are better understood when rather sharply focused, I shall speak most frequently of "Jordan country," after the town of Jordan, Montana. The phrase is descriptive mainly, but it is also a symbol of much wider relations in a belt of country that stretches from central-western Texas northward far into Canada.

Between the Missouri and Yellowstone rivers in Montana there is a tract of land, Garfield County, that has a population of 4250, or roughly 850 families. They are scattered over 5000 square miles of country—an area greater than that of Connecticut. Though there is cultivation of the land, to some extent, by almost all settlers, the population reached an average of one to the square mile as late as 1920 only to fall below this figure in 1930 when there was a decline of over a thousand. This is less than half that (two to the square mile) which was taken by the Census Bureau as the minimum for "settled" country whose nearly continuous border was so long "the frontier":

"All the region outside [west of] this line may be regarded as practically unsettled country . . ."[3] There is not a mile of telegraph or telephone line or railway in the whole of Garfield County. The universal means of communication is the motor car operating upon 600 miles of graded prairie road when not driven pell-mell across sagebrush flats or even across gullies to distant ridge crests. A radio transmitter was in working order for a few months last year, and at the time of my visit in mid-July, 1930, a disabled airplane stood in a field near Jordan, county seat of Garfield County and largest town, with a population of 250. Though there is no way of talking directly with the outside world, the radio receiver permits these isolated folk to hear the world. Whatever else a family may lack, it owns or aspires to own a radio set, for the radio is man's greatest invention in the eyes of the settler who wants to make life tolerable in an isolated situation.

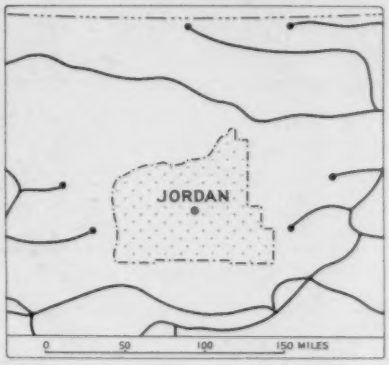

FIG. 4—The railless condition of the Jordan country midway between the Great Northern on the north and the Northern Pacific and Chicago, Milwaukee & St. Paul railways on the south.

It is 92 miles from Jordan northward to Glasgow on the Great Northern Railway (Milk River Valley), and 94 miles southward to Miles City on the Northern Pacific Railway (Yellowstone River Valley). Both these railways lie far outside the borders of Garfield County (Fig. 2). The whole expectation of the Jordan people is focused upon the realization of a project for a railway, 120 to 150 miles long, east to west, that shall cut midway through their best farming country and lift the handicap of distance that now holds back development. For those who live in the northern half of the region the project for a "Federal-aid" bridge across the Missouri River which would give access to the Great Northern Railway is of even greater concern.

THE DRY WESTERN GRASSLAND

The plains portion of the Jordan country (Fig. 9) is marked by long slopes leading down to dry valleys occupied either by small rivulets or by the gravel-strewn beds of wet-weather streams. Only at intervals of ten or fifteen miles is there cultivation in spots here and there, with clusters of farms occupying favorable stretches of valley floor or bench land or stretching far up the slopes where soil and moisture are favorable. As one travels from rolling plains northward

[3] Statistics of the Population of the United States at the Tenth Census, 1883, p. xxiv.

to the Missouri River or westward to the Musselshell, the surface drops off to deeply dissected "breaks" that make a wild and tumbled five-to-twenty-mile border to the plains. Instead of the sweeping lines of the plains and the impression of vast distances, the "breaks" present a chaotic aspect until the eye has grown accustomed to the endless repetition of badland forms and begins to see a few fundamental patterns determined by the regular succession of friable shales, marls, and lignite beds (Fig. 8).

The flood plain of the Missouri is marked by cottonwoods and a good deal of wild shrubby growth, including willows, wild rose, buck brush, and bullberry thickets. Big Dry Creek (Fig. 12) is bordered by a scattered growth of cottonwood. Juniper and cedar look startlingly misplaced in the "breaks" along the Missouri and the Musselshell, for they are found *below* the plains level as well as on a few buttes that rise above that level. Under the noonday sun the color contrasts are not particularly striking, but at the time of sunrise or sunset the fields of deep-green corn and light-purple flax stand out clearly from the dun-colored grama grass that forms the prevailing ground cover. At this time of day the breaks have a depth of perspective that is enhanced by the varied colors of the rock. Some of the layers have been burnt to a bright red, whose brilliance is intensified by dark-gray to black beds of lignite above or below them, while the light yellows and grays of the clay or gumbo beds in almost every tributary gully supply the broadest of neutral-tinted backgrounds.

The deep perspectives and the tremendously long sweeping lines of the valley slopes that rise to crests ten or fifteen miles away make the landscape seem to engulf the scattered human habitations (Fig. 9). The log shack or the sod house or even the more pretentious cottage of the prosperous rancher is an almost undiscernible speck in a wilderness of grass or tangled watercourses or buttes and terraces that make up the rough "breaks" on the valley borders.

Though most of the short grasses of the Jordan country are locally given the collective name of "buffalo grass," the dominant types are more precisely described as grama grass, western needle grass, wire grass, and niggerwool. Grama grass is normally but a few inches in height and forms a uniform ground cover in favored places and gives the semblance of a well kept meadow. One sees it to best advantage in the hollows where the snow drifts during the winter. The greener patches stand out prominently in the landscape, and in the dry season they are often signalized by grazing herds. Grama and needle grass are to be found upon the best soils; and, as one runs into the poorer soils, black sage and salt sage become more abundant, as well as prickly pear and greasewood. It is estimated, that twenty-five head of stock can be pastured to the square mile of grazing country.[4]

[4] Land Classification of the Northern Great Plains . . . *U. S. Geol. Survey*, 1929.

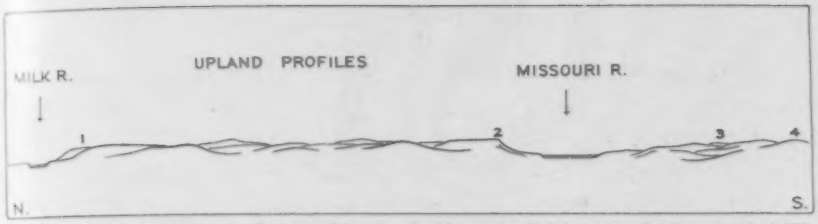

FIG. 5—The upland country of eastern Montana, looking east. It is twenty miles between the Milk and Missouri rivers along the Glasgow-Lismas road. The profiles are typical, but the section is greatly shortened to bring relations into a single view. 1 represents Figure 24; 2, Figure 25; 3, Figure 13, showing characteristic local breaks. 4 represents the end of even-summit upland.

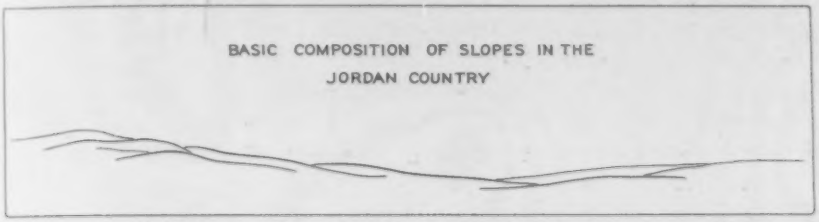

FIG. 6—Characteristic composition of slopes in the Missouri-Yellowstone country. See Figures 9 and 10 for a panoramic photograph. An upland of even summit markedly developed in the Milk River country (Fig. 24) extends southward and ends a few miles south of the Missouri. Upon the slopes of the country represented here the land can be tilled almost to the divides. Locally the crests and higher slopes are too steep or too minutely rough to permit the use of large-scale machinery. If badlands are developed, as in Figure 13, grazing is the only use to which the land can be put.

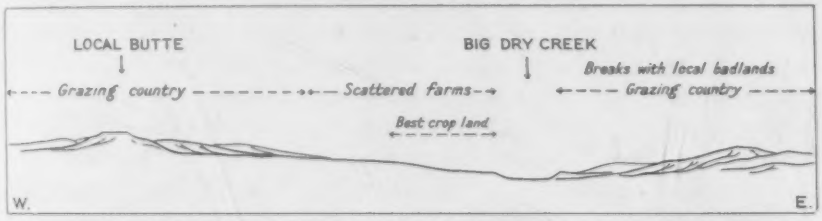

FIG. 7—Topographic profile in relation to land use, looking north from a point fifteen miles south of the Missouri River crossing north of Haxby. A cereal crop in a region of light rainfall requires large-scale farm machinery, and this in turn requires a smooth topography in detail as well as in general outline. The distribution of smooth-contoured slopes in the grassland country (Fig. 9, and the farm belt in sketch above) is a limiting condition of wheat cultivation (without irrigation) from central western Texas northward to Canada.

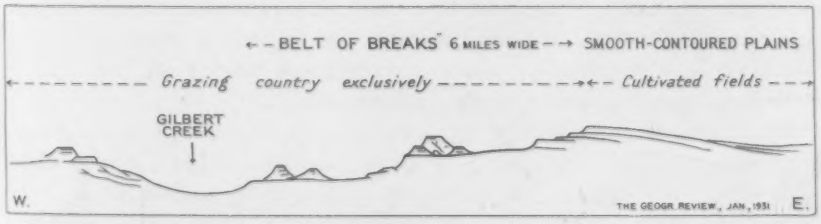

FIG. 8—Profile of "breaks" bordering Gilbert Creek south of its junction with the Missouri River midway between Hell Creek and Dry Creek (Fig. 2). The broad terraces provide good pasture, and the rougher country provides shelter from the cold winds of winter. Cedar and pine grow scatteringly on the slopes of the buttes that stand upon the terraces. The smoother topography on the right extends for fifteen miles eastward without significant change of profile. Farms increase in number eastward in sympathy with the distribution of moister and deeper soil.

FIG. 9—Panorama with Figure 10. The ridge crests in background are ten to fifteen miles away.

This means that some sort of grain crop must be raised if a family is to secure a living upon even twice a 160-acre unit of mixed farming and grazing land. From 75 to 100 head of stock are required to support an ordinary family at an acceptable standard of living. The equivalent of the "increase" of such a herd can be sold off each year to pay the taxes and purchase the family supplies. The size of the herd may fall to 50 or 60 head if there is a fairly well kept garden and if some grain is grown. If the number of animals drops to 25 it means that much more grain must be grown and that either a larger garden must be kept or, as is often the case, the head of the family must be absent for a part of the year earning sufficient money elsewhere to keep the family in food and clothing.

Upon the poorer land with a rough topography, light soil, and steep slopes the drainage is quick and the ground water lies deep. There the acreages must be still larger, for sagebrush, salt sage, shadscale, and greasewood make their claims upon the ground water, and the edible grass may be quite scattered and thin. Ingomar, in Rosebud County (Figs. 2 and 31), is in the center of such a region. About the town is a vast plain of desolation with intervals as great as ten miles between grainfields and there is not a drop of water in the village itself except what is hauled in by the railroad and sold at 50 cents a barrel if it is brought to the house or given away if one goes to the railway station for it. The grasses are nutritious, but they are so thin that a ranch of a thousand acres may be required to maintain a decent standard of living.

The present dry period has taken its accustomed toll of the homesteader of the adventurous type who came in with practically no capital but with a desire to hold the land in prospect of continuous settlement at a later time and a corresponding growth of land values. Up to 1917 the homesteader (who first came in numbers in 1913)

FIG. 10—Composition of slopes near Rock Springs, Mont., panorama with Figure 9.

was out on holiday, so to speak. There was a fair chance for everyone, and the whole of the grazing country seemed about to become a prosperous farming belt. The succeeding dry years resulted in the almost wholesale abandonment of farms with a corresponding effect upon the few scattered towns. Ingomar, for example, while it ships grain, hauled for distances of twenty to seventy miles from the western half of Garfield County, is also a substantial wool-producing center, though one would suppose from the two huge grain elevators that dominate the town that grain growing is still a primary interest of the immediate vicinity. At the present time probably not more than five per cent of Garfield County is under cultivation, which is probably not more than one fifth and possibly not more than one tenth of the potential farm land.

WHAT IS ARABLE LAND?

The region is not one that is capable of full agricultural development in the sense of using all of the arable land for grain. If "average" acreages of wheat are sown in a given year there may be no crop, and the whole growth must be cut as "hay." But the difficulty is that there is not sufficient stock to make full use of such stored feed, with the consequence that it goes to waste. It cannot be sold because practically everybody in the region is in the same situation. In short, what is "arable" in wet years is not arable in dry years in the sense of permitting a crop to be harvested and sold. Averages are of little account in such a region, and so-called percentages of arable land mean little because there is no standard of arability.

The rancher himself must do the guessing year by year as to what constitutes arability, and when he guesses he must take into account the possible increase of his flocks and herds and the extent of land

FIG. 11

FIG. 12

FIG. 11—The line of trees on the right marks the course of the "Big Dry," a creek tributary to the Missouri River (see Fig. 2). An inch and a half from the left-hand margin of the photograph is an isolated group of farm buildings, and the lighter patches near by are grainfields.

FIG. 12—General view across the Big Dry Valley about twelve miles west of Van Norman (see Fig. 2). (Photograph from the Great Northern Railway.)

FIG. 12—General view across the Big Dry Valley about twelve miles west of Van Norman (see Fig. 2). (Photograph from the Great Northern Railway.)

FIG. 13

FIG. 14

FIG. 13—Local badlands south of the Missouri River on the Jordan road. Such "breaks" are developed along all of the main tributaries of the Missouri on the northern border of Garfield County.

FIG. 14—Panoramic view of Jordan, Mont., in the valley of the "Big Dry" (creek). Supplies are obtained chiefly by motor truck from Miles City on the Yellowstone (Fig. 2).

that he can cultivate with equipment in hand. He must stake his labor and money upon a rainfall that may vary as much as fifty per cent from the normal in any one year and is pretty certain to vary as much as twenty to twenty-five per cent in five-year periods. One may find examples of such guessing in every neighborhood. I have

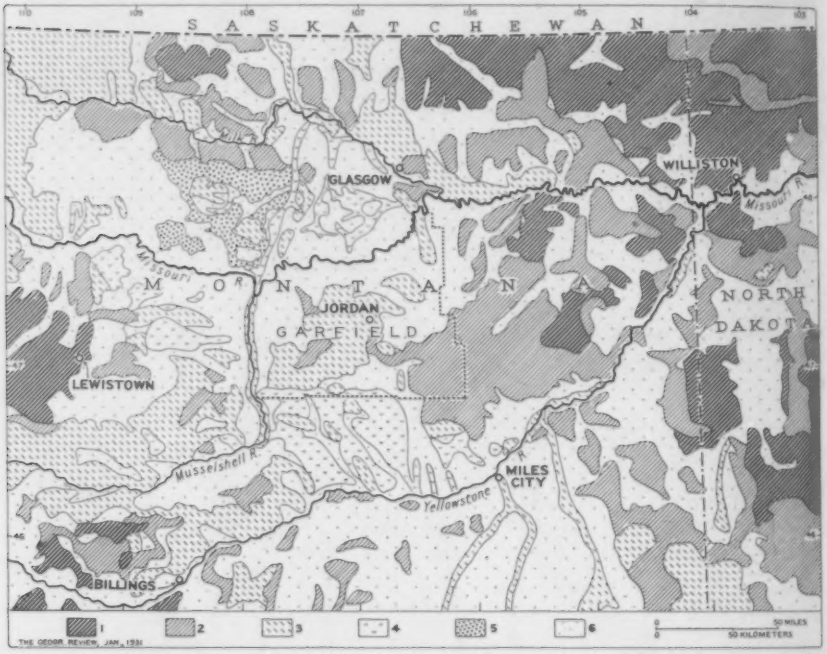

FIG. 15—The general setting of the Jordan country and Garfield County and the land classification of northeastern Montana and adjacent parts of North Dakota. The nearest "big" towns with the population reported for the 1930 census are: Glasgow (2216), Miles City (7175), Lewistown (5358), Billings (16,380), and Williston (4965). Compare the railway map, Figure 4. Land classification is based on the U. S. Geological Survey's maps of the Northern Great Plains. Numbers have reference: 1, farming land; 2, farming-grazing land; 3, grazing-forage land; 4, grazing land; 5, stony land; 6, nontillable grazing land. Compare Figure 1. Scale 1:4,700,000. Note the fading out of the best farming land in the left-central part of the map westward of the North Dakota line and its reappearance in the higher country near the mountain border west of Billings and Lewistown.

in mind a farm of 2600 acres, one of several of very large size in the neighborhood. All of it was in wheat in 1930, and the rainfall was so light that none of the crop could be threshed. The whole of it was cut as fodder for winter feeding. Since it takes about one-half to three-quarters of a bushel of seed per acre, and since the entire farm was in wheat, one may realize the heavy capital outlay for the seeding alone, to say nothing of the labor of cultivation or the cost of running a tractor over it. Only a few farms in the Jordan country had threshable wheat in 1930, that is a crop running eight or ten bushels to the acre. Since it costs $2.50 per acre to "combine" it, that is cut and thresh it, and since it costs on the average 35 cents a bushel

to haul it to market (50 to 100 miles), the whole of the proceeds of such a crop may go into the harvesting and marketing and nothing at all be left for seed, taxes, and labor.

Of course this means resorting to special crop practices wherever practicable. Flax yields exceptionally well if grown on new ground. Three or four bushels to the acre is a fair crop in a dry year, the haulage charge is less, and it fetches from $2.00 to $2.50 a bushel. In years of heavier rainfall it pays extremely well and is seeded right into newly plowed ground—plow, disk, and seeder being attached in series behind a gas tractor. I saw a number of fields of flax 200 acres in extent near Rock Springs. The first crop of corn on newly turned natural prairie sod is astonishingly large even in the driest of years on account of the stored moisture and the weedlessness of the land. On approaching such a field, especially in time of drought, one is certain that it must have irrigation in view of the contrast between it and the scattered and stunted growth of corn on the weed-choked older cropped ground. Thus a farmer may save up virgin prairie for a series of dry years before "breaking" it, being assured of a crop when he does cultivate it. The new homesteader is frequently misled by these marvelous results in flax and corn and, attempting to secure a second crop with light cultivation, may fail entirely.

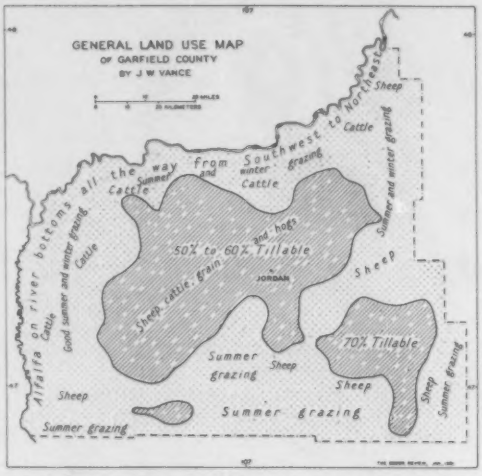

FIG. 16—Generalized sketch of Garfield County, by J. W. Vance, showing the types of land use recognized by a resident who knows the quality of the soil, the layout of the topography, and the high rainfall variability. Compare Figure 1.

With motor transport subsidiary to an east-west railway through the Jordan country there is no reason why diversified farming should not greatly reduce the present crop hazards. The "diversities" would include cream and hogs and poultry as well as a better adjustment of sheep and cattle to the respective areas where they will thrive best. These products are not all equally dependent upon rainfall and it is drought that establishes the present danger line.

GRAZING AND THE WINTER HAZARD

The time has nearly passed when one can follow the cattle business exclusively. "The cattle business is no longer a business but a dis-

FIG. 17—Prosperous two-thousand acre ranch of J. W. Vance twenty miles north of Jordan in a typical setting of lower irrigated land, moderate slopes with dry-farming cultivation, and higher ridges and hollows that support several hundred head of stock. (Photograph from the Great Northern Railway.)

cultivation, and higher ridges and hollows that support several hundred head of stock. (Photograph from the Great Northern Railway.)

FIG. 18—General view across Lone Tree Creek, thirty-four miles west of Jordan showing wheatfield on the Frank Sparlin farm in foreground. The crop is hauled to Ingomar, sixty-two miles south, one round trip a day being made by motor truck. Until a few years ago horse-drawn trucks made the round trip in six days. In 1928 there was produced 10,500 bushels of wheat on 500 acres. (Photograph from the Great Northern Railway.)

ease," said one discouraged rancher. He was referring to large-scale operations conducted upon scattered holdings of grass. Continuous acreages of large extent are difficult to find if one is in the market to buy, and they are difficult to hold because of the increasing value of land and the rising level of taxes. It takes an investment of $150,000 to $200,000 in cattle to enable a man to make $10,000 or $15,000 a

FIG. 19—Hereford cattle seem to be best suited to the grazing conditions of the short-grass country. It is seldom that any other breed is seen. (Photograph from the Great Northern Railway.)

year, for the cost of labor is high and the cost of posts, wire, tank equipment, and the like is constantly increasing. A bad season, that may come in any year, may require the sale of substantial portions of a herd at the bottom of the market. The recent slump in the price of meat has cut the value of many herds in two, and at such a time the creditor bank calls no man brother.

The length and severity of the winter is a matter of great importance to the stockman. If his ranch includes a considerable extent of "breaks" his cattle may find shelter from the occasional blizzard, and the broken nature of the ground makes the grass accessible to stock. If the farm ranch includes only flat or gently rolling land the snow may lie rather evenly upon it and the stock be unable to pasture afield. Normally the period of winter feeding is half the year, the remaining half alone being available for sheep and cattle grazing at considerable distances from the stored feed of the valleys.

The man who depends on sheep grazing for a living must have not only a much larger holding of land but is kept very busy looking after his flocks, or "bands" as they are called. He employs sheep herders, but their business is to see that the flock is protected, that the salt is put out, and that bedding grounds are well selected—not to do the manual labor of farm or corral. The farmer must provide

the hay, arrange for labor to distribute it on the feeding grounds, and provide the water supply. Cold and snow require constant watchfulness lest the flocks stray too far as they drift down the wind and thus get caught in snow-drifted places and perish. When the bands of sheep are not brought in for steady winter feeding they must be herded along the "breaks."

FIG. 20—Sheep grazing on the "short grass" of the Jordan country in a region of smooth-contoured topography. (Photograph from the Great Northern Railway.)

The years of exceptional snow are reference points in the life of the region. In 1907 there was fifteen inches of snow on the level, and the night of December 30 of that year is remembered because a glaze of ice a quarter of an inch thick formed after rain so that the stock got sore feet trying to paw through it to the grass below, while the horses were skinned to the knees in trying to get to forage. In 1929–1930 the winter lasted for 150 days, and a good many sheep owners were down to their last handful of feed before even the first of the natural pasture could be used.

On the other hand, if the snow is not deep in the winter time, the water supply may be inconveniently diminished the following year and the moister hollows of the pasture land may not make their accustomed growth.

"WHO IS MY NEIGHBOR"

I was surprised to discover in so many communities of the dry-farming ranching country that hospitality is reserved for the stranger rather than the neighbor. It seemed, in some communities, as if there were very few men who had not a hard word for some neighboring landowner. If this had been the case in one community it could be called a local bad habit, but I found it in Oregon as well as Kansas

and in Nebraska as well as Montana. I found men quite ready to talk about it. They were all quick to say that it was difficult to get a community to work together. The condition has grown out of an almost uniform pioneering experience. We are accustomed to extolling the good qualities of the pioneer. Here is one of the weeds in his garden.

FIG. 21—Cattle on the Mackay Ranch, twelve miles north of Jordan. Compare this mixed ground cover with the short-grass type in Figures 19 and 20. (Photograph from the Great Northern Railway.)

When there was plenty of free range a neighboring cattleman was too far away to be a rival. As soon as the range became restricted and there were smaller holdings by title, it was generally because the farmers had come in and run fences around their homesteads. At once quarrels began; and down to two years ago they were still active in western Kansas in the region between the Arkansas and the South Platte, as they are active now in spots in the Jordan country. The small cattle owner is generally one cause of the difficulty today. He owns too small a farm to keep stock and allows his cattle and sheep to graze on land from which the owner is absent or cuts the wire fences of larger landowners permitting his stock to feed on a tract grown to natural grass and reserved for winter feeding. Now the sense of proprietorship is as strong as the struggle to get established was hard. All reveal with large gesture the sense of earned possessions.

The clash most frequently comes over the use of the remaining free range or that which is "free" by neglect of the owner. One gets from free range what one has not earned except in the sense that one stuck to the fight and was there to take the free range as a privilege. The homesteader, as opposed to the earlier pioneer; is often an adventurer, a speculator. He wishes to hold until permanent settlers have come in and then sell at a profit. In the eyes of the old-timer he has

few "rights" and should have no privileges. The old-timer feels that he has earned the privilege (he would call it a right) to pasture exclusively *his* cattle upon free range (where there is accessible water) as he has always done. The law slants his way because it stipulates that cattle and horses (but not sheep) may be grazed free upon un-

FIG. 22—Taylor Brothers' thousand-acre ranch thirty-three miles northwest of Jordan. It commonly supports one hundred and fifty or two hundred head of cattle. Two hundred and fifty acres are under cultivation: flax, wheat, alfalfa. (Photograph from the Great Northern Railway.)

fenced homesteaded land which the owner has proved up but left temporarily until he can sell it. There is much of this land in Montana as well as in Idaho and Oregon.

When a large landowner with capital gathers many sheep and cattle and drives them over the free range to save his own pasture for open winter feeding, he may be taking what a poorer and needier man feels he ought to have. But the poorer and needier man is an interloper in the eyes of the older settler who stuck through the lean years of the past. He may be a neighbor, but he is an interloper nevertheless. Each appears greedy and unfair to the other. The opportunities for the display of greed and even for outright intimidation and for sheep or cattle killing are increased by the laxity of the homesteaders who have title and do not live on their land. There is no strict supervision of such land even when it reverts to the county for nonpayment of taxes. A wire fence is easily cut, practically never tight enough to keep out sheep, and never more than a slight protection for stacked hay or grain. Loans from the local bank may be refused the small owner at the instigation of the large depositor whose account is important and whose use of free land is thus upheld indirectly. Hotly contested local elections with much ill feeling growing out of

rivalry for insignificant posts are often a curious mixture of land and cattle rivalries. "We threw out the old gang," said a member of the victorious group in a local village election of 1930—a hard saying in a town of fifty families!

One Doctor to Five Thousand Square Miles

The wide dispersal of the population in the Jordan country with but one town of sufficient size to support a doctor in all the great stretch of country between the Missouri and the Yellowstone, including areas far outside of Garfield County, means that there is a distinct group of hazards relating to public health. One doctor to 5000 square miles of territory, to take Garfield County alone, means that everyone must take chances on anything in the way of illness and accident. The striking thing is that this high risk does not drive people out, though it definitely keeps out some who would otherwise come in. The common answer to questions of health is, "We never get sick out here." It is true that epidemics are rare and local on account of the isolation and the dry climate.

The roads have been so well laid out and they are kept in such good repair that in fine weather one may travel almost anywhere at a speed of forty or forty-five miles an hour. A visit in fair weather deceives one into believing that the roads have made life much safer; and indeed they have, though only in the period of good weather. With rain and snow upon it, the gumbo or sticky clay of the road surface becomes so slippery that the speed is cut down to ten or fifteen miles an hour and even to the point of impassability with motor cars. Drifted snow presents an additional special problem.

The condition in the Jordan country before the use of automobiles became general is well described in a government publication, "Maternity Care and the Welfare of Young Children in a Homesteading County in Montana."[5] Down to about 1900 neighbors were some fifty miles apart in the Jordan country. With the opening of the region to homesteaders (the most rapid influx of settlers was in 1913) most of the land was taken up. Road building became the first requisite for the communication of neighbor with neighbor and more particularly for reaching the markets far to the north and the south. But the roads were prairie roads for the most part. Down to 1917 there were but seventy miles of made road. While at the present time it is doubtful if more than a half dozen families are without some sort of motor vehicle, only one family in eight had automobiles in 1917. Flooded creeks and the absence of graded roads meant that families were cut off for days from even their immediate neighbors. Mails were sometimes delayed a week at a time, and the parcel post

[5] *U. S. Dept. of Labor, Children's Bur. Publ. No. 34*, Washington, 1919.

FIG. 23

FIG. 24

FIG. 25

FIG. 23—In the dry-farming country the acreage harvested in one year is matched by acreage in fallow for the following year, as on this farm near Glasgow, Mont. (Photograph from the Great Northern Railway.)

FIG. 24—The irrigated valley of Milk River looking north toward Glasgow, from the southern valley wall.

FIG. 25—Ferry across the Missouri River at Lismas, south of Glasgow, on the way to Jordan.

for months. As one woman remarked of the receipt of packages from mail order houses, "People have Christmas till Easter." Winter underwear ordered in the autumn reached one family in the spring. While there still is no telephone in Garfield County today the telephone lines are advancing here and there toward its borders, albeit slowly. As late as 1917 only 26 out of a total of 500 families lived within 25 miles of a telephone: 7 out of every 10 families lived 50 miles from a telephone, and 32 families had no telephone within a hundred miles.

Under these conditions people fear snow and ice from the standpoint both of inconvenience and danger of illness no less than from loss of cattle. Even today appendicitis cases must be taken at great hazard to the single hospital at Jordan, completed only within the past two years, or, if more accessible, to Miles City in the Yellowstone Valley. In the days of horse-drawn vehicles the danger was naturally much greater, and some patients died on the way.

"The whole area is young and struggling," and if this be true of the ordinary conditions of life one might suppose that women would be loath to follow their husbands into a country that obviously tries the strength of men. The single physician in the county says that half of the maternity cases are unattended by a doctor. There is scattered midwife assistance, and in not a few cases the mother attends herself or is attended by her husband. The women lead an outdoor life and for that reason are strong and make astonishingly little complaint about their hard situation: "The women make no fuss about things." Under these extreme frontier conditions—extreme because the dry-farming-ranching combination of land use does not accelerate the growth of towns and bring the doctors and nurses that come more quickly on the heels of settlement in a region of normal agriculture—the rate of mortality in confinement cases is high. In 1917 it was estimated that Montana had an infant mortality rate equivalent to that of Spain: it still has the highest rate of all states in the Union.

Coöperation among the members of a community is indispensable under these special conditions of public health in new territory. An illustration from the Canadian plains country reveals the generality of the process. In the sparsely settled areas of Saskatchewan there has been developed within the past year a system that provides for municipal doctors. Over 65 per cent of the population of Saskatchewan lives in 301 organized rural municipalities. The Rural Municipal Act of the province gives each municipality the right to make an annual grant of $1500 to a legally qualified medical practitioner who is a resident or easily accessible on call, or it may guarantee his income up to that figure. He must then give free medical service to indigents and if necessary perform the duties of a health officer. The municipal council may even engage a physician for full time services at a salary not exceeding $5000 a year. Over twenty such municipalities have

engaged physicians at salaries or allowances ranging from $900 to $5000 a year, and the system is reported to give much satisfaction because it guarantees the physician a reasonable income at the same time that it guarantees the settler indispensable medical services.

Schooling and Housing

It is the mothers who take the keenest interest in the establishment of schools. "The hardest thing is no schooling," said one. The schoolhouses are small one-room shacks. A new schoolhouse is shown in Figure 27. The greatest difficulty is the problem of securing teachers to live for eight or nine months at a time practically without social contacts except those afforded by half a dozen families living in small shacks in isolated districts. In 1917, seven out of ten families lived in houses of one or two rooms. In more than half of the houses there were three persons to occupy each sleeping room. The log house, sod house, tar-paper house, and dugout were the prevailing types. Only about half the houses were screened.

In recent years conditions have been substantially improved through the steady construction of screening, of frame houses of larger size, and of domestic conveniences in so far as these can be introduced in the absence of electric current or water power or local generators. "People complain about the wind sometimes, but they ought instead to be grateful for it," said the wife of one old-timer. "When we first came into the country there were no wells, and water was so scarce at times that we had to haul it from five miles away, and some neighbors went much farther. We melted snow for months at a time during the winter. Now we have a windmill."

One natural advantage possessed by the region is stressed on every hand: "We could not live here if it were not for the coal." The "coal" is really lignite. It is well known that Montana is underlain with immense beds of lignite. They crop out in the "breaks" as thick seams of carbonaceous beds that have only to be followed up until one comes to good quality lignite that is either free or that can be had for an insignificant royalty. The lignite is loaded upon farm wagon or truck and carried to basement or outbuilding for winter use and for cooking throughout the year.

One sees on every hand the evidence of continued amelioration: addition of a room or two to the original primitive homestead shack, replacement of the tar-paper shack by a frame dwelling, abandonment of the dugout, well-drilling in progress, separation of shack and corral to get rid of the pest of flies, growth of a windbreak of trees and shrubs, betterment of the local farm road leading out to the highway. The good roads now make it possible for those in the vicinity of Jordan to live in the town and drive out to their farms. Everyone believes that

FIG. 26

FIG. 27

FIG. 28

FIG. 26—Sheep herder's wagon at crest of ridge in midst of bedding ground in local "breaks."
FIG. 27—New log schoolhouse on Missouri River terrace near mouth of creek.
FIG. 28—The spaced shrubs in the foreground are the beginning of a windbreak to shelter the ranch buildings in the middle distance.

FIG. 29

FIG. 30

FIG. 31

FIG. 29—Main street of Jordan, Mont. See also Figure 13.
FIG. 30—The single dwelling, store, and post office combined, at Haxby, Mont.
FIG. 31—Main street of Ingomar, Mont. (Fig. 2).

the coming of the railroad would bring still further amelioration, would give "life" to the region and a marvelous land development. Everyone believes that it would at least stabilize agriculture and grazing. Part of the present grazing territory would then be farmed. The aspect of hope is important. It makes living conditions tolerable.

A Gasoline Culture

The whole culture of the dry western grass country is built on gasoline. There would be a wide retreat of farming population if gas were not available. Horses could not give the speed on the roads or the rate of cultivation on the farms required for a short seeding and harvesting season with tremendous acreages and a limited time in which to haul the crop to market. In three thousand miles of driving on country roads in July and August, 1930, I met but four horse-drawn wagons.

Even under present conditions of large ranches and motor transport the standard of living cannot be high, and luxury is almost unknown. One may see 320 acres, or twice that extent, of rich grass alternating with cultivated fields on which fair crops of wheat or corn may be growing. With a firm road underneath, a cloudless sky overhead, cool breezes, and wind-rippled hillside "meadows," one may think it a land of plenty. But the owner finds it difficult to raise the money to pay his taxes. He may have a radio as his one luxury and his family may be housed in a two-room dugout or a tar-paper shack. He may own a square mile of lovely countryside, but his wife may be required to carry the water half a mile for kitchen use.

The dry-farming region of the western Great Plains is a land marked by the special combination of dry farming and stock raising plus good roads and motor transport. With these and a sufficiently large holding of land, *and above all a low tax rate*, there is a chance to get ahead, pay off the mortgage, increase the convenience if not the luxuries of the home, and lay up a sufficient reserve to enable the owner to maintain himself through the hard years of drought.

A Special Problem in Transportation

The Jordan country has a special problem in transportation, like all communities that are far from the railway. The first analysis of such a problem is generally expressed in a map showing distances from the railway measured in units of ten or twenty miles. Such a map permits one to make certain broad generalizations for the country as a whole. Its principal defect is that it makes no allowance for the constantly changing value of distance as affected by the cost or quality of the labor supply, the uphill and downdale (topography) that must be taken into account in covering any given distance, the crop that

must be moved, the market, the type of vehicle or transport generally employed, the road system that is available and its condition. Vernal, Utah, turns its back on a narrow-gauge railway twenty miles away which leads to a railway center of like products and trucks its grain, live stock, honey, and cheese to Salt Lake City, 184 miles by improved road, where a larger market is available. One Utah community sends its products, including cream, by pack train thirty miles to a highway.

From the map (Fig. 2) one sees the position of the Missouri River, interposed between the Great Northern Railway and the Jordan country. In summer the river may be so low as to delay ferriage, and in winter and spring it may be so filled with drifting ice or covered with thin ice as to hold up traffic for weeks. This changes the routing of those districts immediately south of the Missouri River, increasing the distance to the railway to 150 miles at Miles City or requiring a roundabout course to a bridge 40 or 50 miles east of the ferry crossing. Thus mere distance on the map has to be transformed into seasonal distance. Combined with the difficulties just mentioned are those of drifted snow and muddiness, with the result that the different parts of the county have widely different attitudes and problems with respect to distance alone. It is therefore only when we break up distance into its actual operating components in a given region that it has any scientific value in determining the habitability of a place or in restricting the growth of a region or halting the social development or influencing the kind of economic activity that is practiced or is feasible.

Such an analysis can seldom be made except in the field, by inquiry on the spot. It involves not only a study of the texture of the topography but also the opinion of the people themselves, the policy of the region with respect to road problems and prospects; for upon prospect much depends also. Almost every region far from a railway or a good road has in mind the construction of a highway in the near future. Sometimes settlers go far beyond the effective economic haulage of products because they *expect* a railway or highway to be built; and they often stay in distant localities under great economic handicaps even after the point of saturation has been reached and generally acknowledged, in the hope that political action will get that which economic law denies.

The West is still "new." In a belt of territory that is at least 200,000,000 acres in extent the talk of the countryside is still about railroads that may come or are building, of a road program that will provide new outlets and speed traffic toward new centers, of bridges here and there that will shorten distances by 40 or 50 to 100 miles. Directly after the war we heard a good deal about the lessening of total mileage of railroads in the country, but this relates principally to the East. The West still builds railways. The Northern Pacific

built an extension to Bend, Ore., in 1915; extensions of the same road to triangles of wheat-growing territory in northeastern Montana have been made within the past five years with vastly stimulating effects upon large farming areas because they have cut hauling distances to economic limits. A line is now under construction along the eastern border of the Cascades to connect the Northern Pacific and the Southern Pacific via Bieber, Cal.

If the standards of railway construction had not been worked out in the pre-motor era and the railways built without thought of motor competition—with heavy rolling stock, permanent roadbed, relatively low gradients—it is doubtful if the financial risk could now be taken of building them. Certainly they could not now be built in the bold style of the original builders. The advances of today are extremely cautious, as indeed they must be to justify themselves in the face of a rate control that prevents the enjoyment of profits above an extremely low level and that offers no offsetting guarantees in case of loss. The effect of stringent rate control at present levels is to force the railways to halt their building programs until development of mines or forests or agriculture has actually taken place or is guaranteed by large capital interests on the point of investing. The railway, in short, can no longer play the traditional rôle of western railways and be itself a pioneer. Empire building by railway is a thing of the past. Rail gaps are filled here and there when the areas in question are already partly occupied by settlers. Passenger traffic is heavily discounted by the motor car and the almost universal good-roads programs of counties and states. It is the people of an undeveloped region, rather than the railways, that now most actively build up sentiment for a new line.

Technology and Pioneer Settlement

It is probable that the land of the Jordan country is producing only about half as much as it could produce under more scientific management. Such management would include a farm loan plan definitely set up to finance the farmer and the rancher during dry years. When the crop is a failure, or nearly so, it does not mean merely that there is withdrawn from the farmer's income an amount represented by a good crop. The dry year and poor crop require him to dispose of live stock at a loss, and this is live stock that he may have been assembling, or breeding, up to what he considers to be a safe carrying level for his land. If the natural forage is poor and the grain crop a failure either for threshing or for hay, the owner may be set back in his plans not for the year immediately following the drought but for four or five years. It takes that interval of time for him to build up his flocks and herds again. But it may be and often is pre-

cisely in that period that the rainfall is heavier and the forage good if he only had the stock to make use of it.

If three or four dry years succeed each other there is also a marked deteriorative effect upon grain. This requires the settler either to sow poor grain or to import expensive grain for seed.[6] Obviously the economic and natural conditions that surround him call for the application of *an equalizing process* if he is to remain upon the land and not be defeated with each recurrence of dry years. That equalizing process must be government, since business operates to the personal advantage of those that engage in it. County, state, or nation must supply the equalizing process. Average conditions or average years mean nothing in such a climatic and economic set-up. Nor must it be supposed that the benefits of good years will enable the persistent farmer to meet successfully the bad years. In the first place, science is yet unable to tell him with assurance when the bad years will come. Long-range forecasts of weather conditions are not yet available. Therefore he cannot be prepared for the bad years. If he is conservative by nature he has no place in the dry-farming country. He can only reap the advantages of wetter years by supposing that *any* year may be wet.

The strong westward shift of the line of dry farming during the past ten years has been marked by a burst of technology into a field whose possibilities were not fully realized until high taxes on the older lands and the falling price of wheat had intensified the search for new land in which the new technology could operate more effectively. The newly cultivated lands represent only a new field of application for inventions that already had been highly developed in adjacent territory. We owe the shift also to the fact that the tax assessor in a sense lags behind development. His judgments must be based upon the realities of the moment. In the grass country, where the standard of value was determined by what one could do with the stock, he could not assess on the faith that it might raise wheat. The man who felt the oppression of taxes in eastern Kansas, Nebraska, and the Dakotas could try his luck with wheat in the virgin grass country. If the season or the site of his farm permitted him to succeed with a crop, he found himself paying relatively little interest on his low-priced land and smaller taxes with a larger crop. He took greater chances with the seasons, but there was also the greater chance of gain.

"We came out here because we had to live," said one man who had established himself in five years upon his own farm now fully paid for, fenced, and otherwise improved. He had been unable to make headway in the older community from which he came four hundred miles east, because, as he said, the interest on the mortgage took what was left after he had paid his taxes, three fourths of which

[6] Coöperative organization in Montana permits the counties to obtain seed on government credit.

were spent on roads and schools. It is not without significance that the problem is a general one east as well as west in the older communities. Measures of relief enacted by the New York State legislature during the past two years saved the rural counties huge amounts in the completion of their highway programs and increased the amount of aid extended to them in the construction of local dirt roads and the improvement of the rural schools. In addition, the direct state tax on real estate was abolished, so that all of such taxes revert to the several localities.

Of course the tax assessor in dry-farming regions in process of rapid development is not long in raising the tax rate, but the rise lags behind the event. In those few years the farmer or farmer-rancher may pay for his farm and perhaps add a second one. With good crop years and wheat at a dollar and a half, a man might pay for his land with three good crops. In some counties the tax rate has risen by as much as 40 per cent in a single year but from so low a level that it is still small. Sixty dollars on a square mile of land, of which sixty acres is in crop and the rest in pasture, is not a ruinous rate. The scheme of federal highway aid has carried road building to the point of saturation in Garfield County, so that taxes for highway construction are limited to the service of the outstanding bonds and the cost of repair and conditioning. More people mean more county offices and more schools, and the test of efficiency in local government will come when the first efforts must be made to keep these costs proportional to increase of population.

The whole dry-farming region is marked by two broad types of farming: the one directed mainly to the business of making a living, the other to the making of profit on invested capital, or commercial farming. Mixed farming is the prevailing mode in the first case, one-crop farming in the second. Commercial farming is still possible because the price of the land was at the ranching level when the land was bought by the capitalist after the homesteader had abandoned it in the belief, fostered by the dry years, that after all it was a cattle and not a farming country. One finds all gradations between the two types from central-western Texas to the Canadian border.

Statesmanship in Pioneer Settlement

The attention of the national government has been so sharply concentrated upon irrigation in the dry West that the public is little informed on the much more significant work that is being done in the way of intensive studies in type areas and in the making of land classification studies. There is acute present need for the special qualities of statesmanship in land use. This statesmanship is something over and above the technical studies of the day. It has to take

account, among critical factors, of the attitudes of men as well as the soil types and the variability of rainfall.

The matter becomes clearer if we look at the specific obligations of a state that desires to achieve the full exploitation of its resources. If the technology of the day is in advance of the experience of the people of a given region the state must step in to make the technology known. For it can do collectively what the individual or the small community cannot do. It can apply to a given problem all the technology that is available. The ideal state would not only do this but would then carry out policies of economic exploitation more precisely adapted to the fundamental conditions that underlie successful living. Naturally this requires standards as to what successful living is, that is, not only what man can do in the abstract but what men can do and what they ought to do in the concrete, natural region by natural region. This means, furthermore, that the state must import technology from the outside, for no state has had the experience of all the world. Russia and Brazil and China and Japan are also in the picture. Their experiences flow through books and maps and men. To take this point of view is to say that *the technologist is a creator of power, but the state must create or encourage the creation of the channels through which that power flows.*

Political action is traditionally far behind either the statesmanship or the technology of the day. To the extent that we intend to use all of the resources of our land the statesmanship of science must be insisted upon, that is that special process by which we trace the applications of power to their consequences. We are here face to face with two distinct kinds of criticism and conflict, the one having to do with ideal statements of policy with respect to individual things, like soil or forests or minerals, the other having to do with the regional composition of resources and conditions and powers in a way that is feasible. Our machinery at the present time includes nation, state, and county as the three principal means by which a subdivision of power is sought that has its ultimate result in the way in which people make a living from the land. Naturally, the coördination of these three agencies is not ideal. The thing works loosely and approximately. It is still a question whether the state can do more than this without creating an overhead of expense that could not be supported by a land of meager resources.

We need, for one thing, to have an exact study of the advances and retreats of population in wet and dry years in regions of pioneer settlement. We need to know how extensive they are, how severe the conditions that create them, and how they affect permanent occupation. The old advances and retreats of population as a series of dry years succeeded a series of wet years is now no longer so important in the dry West as the sudden contraction of credit, the forced

sale of live stock, the squeezing out of the marginal farmer and rancher who ought to be maintained upon the land if we are to use the abundance of nature even upon his poor acres in a series of wet years. We need to know, further, what intensity of production is required in various lines to warrant highway and railway extensions and farm aid on any specified scale. We need to study recognizable regional trends of land occupation, limiting distances from railways and highways for various combinations of crop and stock.

The sense of neighborhood becomes an important factor in the development of new land. People do not live in a table of statistics but in communities. New counties are organized when there is an awareness on the part of a group of people of their community relationships. People in the West live by counties or "countries" not by states, for few state functions impinge directly upon the life of a community, as in the case of roads and schools. A county has a neighborhood stamp. This is not, primarily, a matter of political evolution but of economic evolution. When economic development has reached a certain point the political arrangements are revised so as to make the political machinery serve more directly the specific needs of a community.

Standard of Living

What is needed really in a study of such a region is not the measure of agricultural potential but the economic geography, which combines that potential with the actually operating forces prevailing in the economic world and the balance which these maintain with the so-called standard of living. In both the range land and the dry-farming country of the dry western border of the Great Plains it is the standard of living that people have in mind in talking about current prices and the crop of the year. As one man put it, "Everybody wants everything." That is because they know about everything. The radio and the motor car have made that knowing easy. The radio brings the world to the interior of every shack and every dugout as well as every first-class modern home. It is constantly suggesting things to people who never knew about them before. The motor car operates in the reverse direction, taking people out to the towns. "Going to town" is the one diversion in the Plains country, however small the town that it may take two hours to reach or however meager may be the displays in the store windows. But it makes the process of seeing a much more frequent one, many times more frequent than it used to be, and what with the seeing on the one hand and the hearing on the other, tastes are "elevated." It may be deplorable but it is natural that everybody wants everything. We are informed by current economic philosophy that this is a good thing for the country as a

whole. There will be more buyers of goods, hence more prosperous industries, and so on in a circle.

This means, however, that public policies have to be shaped accordingly. If the local tax rate is going to squeeze out all the profits, it will defeat the scheme of large holdings. On the other hand, if the best economic use of a large holding is not made by special devices that enable the settler to survive the years of drought, the landowner will be unable to pay his proportional share of taxes and will thus reduce the capacity of the county in which he lives to construct good roads, maintain public health measures, support a county agent, and provide adequate schooling. "A humane society would use scientific method, and intelligence with its best equipment, to bring about human consequences" (John Dewey).

THE AGRICULTURAL POSSIBILITIES OF ITALIAN SOMALIA

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IN a preceding article the author pointed out that the future of the Italian colony of Somalia lies particularly in the development of industrial agriculture.[1] It is here proposed to examine that prospect in greater detail. Its importance for Italy is not to be denied when we consider that she imports annually from abroad about 150,000,000 lire's worth of vegetable oils, about 650,000,000 of oil seeds, and about 1,800,000,000 of cotton. These are all products which can be grown in Somalia. To what extent can they be produced to meet the demands of the mother country? First we must examine the natural conditions in this colony on the shores of the Indian Ocean.

Plateau, Plains, and Sand Hills

Three sharply defined physiographic provinces form successive zones running roughly parallel with the long and uniform coast line. Since, however, the coast trends north-northeast and south-southwest while these zones extend northeast and southwest, the two interior provinces actually reach the coast in the northern part of the colony.

The innermost province marks the southeastward extension of the great Ethiopian plateau. It may be compared to an inclined plane, the northern rim of which, from the mountains of Arussi, Harrar, and British Somaliland, falls away steeply northward into the trench comprising the valley of Hawash and, farthest east, the Gulf of Aden. Southward toward the Indian Ocean the inclined plane slopes off gently. The plateau here is regular, uniform, and in places almost absolutely level. The larger rivers alone have cut valleys beneath its monotonous surface. Between Cape Guardafui and Obbia the plateau zone reaches the coast, but south of Obbia it is separated from the sea by the second of the three provinces—a great level plain which widens as one goes westward. The third province, bordering the seacoast from a point near Obbia to the mouth of the Juba, consists of a long, straight, narrow line of hills.

The plateau province is prevailingly rocky: only along the southern margin, where the plateau surface—here low and almost level—

[1] Giotto Dainelli: The Italian Colonies, *Geogr. Rev.*, Vol. 19, 1929, pp. 404–419.

first emerges above the plain, do tracts occur over which the rocks are covered with fine detrital materials, the product of weathering in place.

The second province, that of the plain, on the other hand, is made up entirely of alluvial deposits laid down by the rivers, the Webi Shebeli more especially but also the Juba. The third province consists of a line of ancient sand hills, more or less consolidated, on which rest the free-moving sands of dunes now in formation.

FIG. 1—Sketch map of Italian Somaliland showing land above 250 meters elevation. Scale approximately 1:20,000,000.

Over these three parallel zones a dry and, so far as temperature is concerned, uniform climate prevails. The mean annual temperature at the port of Mogadishu is 23.3° C., with a range between the coldest and hottest months of only 3.8°. Although beyond the coastal zone the mean annual temperature tends to be higher (in the interior of the colony at Bardera it is 27.1°, and at Lugh, 30.7°), the annual range from the mean remains fairly constant, about 4°. The average daily range of temperature is also slight, about 7° along the coast and 10° in the interior. Much more marked are the variations in the rainfall. There are two rainy seasons, a principal one in the spring (April and May) and a secondary one in the autumn (October and November). The annual rainfall, about 300 millimeters over the coastal zone, reaches 500 millimeters or even more in the interior plain, approaching 800 millimeters in some localities and probably rising even higher over the more elevated parts of the rocky plateaus at the headwaters of the rivers.

Two of these rivers are of first importance, the Juba and the Webi Shebeli. Of the two the Juba is the largest. Fed by a broad fan-shaped system of tributaries rising in the mountains of Arussi and vicinity, the Juba makes its way southward to the coast, crossing obliquely the three physiographic provinces of the colony. In the rocky plateau the stream at first passes through a deeply incised valley; farther south, where the surface of the plateau is lower and more nearly level, the river resembles a canal intrenched between

rocky walls broken only by the ravines eroded by a few tributary torrents. Once the southern edge of the plateau is passed and the alluvial plain entered, the Juba progressively takes on the character of an aggraded stream. It has built up its banks to a higher level than the surrounding country, from which it is cut off by natural levees. Back of these levees stretch lines of ponds and marshes formed by tributaries that can no longer find their outlet into the main channel. This character the Juba maintains almost to its mouth.

The flow of the Juba has been measured at over 800 cubic meters per second during high water. The régime of the river depends primarily on the amount of rain falling on the plateaus (the great rains coming in July-September, the lesser rains in February-March), although along its lower reaches it is also affected by local rains.

The Webi Shebeli is of even greater importance. Fed from the mountains of Harrar by a great fan of tributaries, like the Juba, it also flows southward toward the coast, crossing the plateau in a valley that is at first more or less deeply eroded but farther down forms a canal-like trench. The Webi Shebeli, however, differs from the Juba in that it does not succeed in crossing the alluvial plain to the sea. Obstructed, apparently, by the coastal dunes, it turns southwest and, running parallel with dunes and coast, follows the whole length of the alluvial zone, almost joining the Juba near the latter's mouth. But, whereas the bed of the Juba here stands above the level of the plain, the Webi Shebeli dwindles away and disappears in the marshy region of Balli.

Throughout the greater part of its course across the plain, the Webi has an aggraded channel paralleled by a line of ponds and marshes which owe their origin to the escape of waters of the river itself during times of flood. The absence of tributaries throughout its entire lower course, together with climatic circumstances, leads to a notable shrinkage of the flow as one goes downstream, until finally the water becomes stagnant and finally, through evaporation and infiltration into the ground, disappears altogether. The daily loss of water in a stretch of 240 kilometers has been calculated at 170,000 cubic meters.

Natural Vegetation

Each of the three physiographic provinces is characterized by a vegetation type that differs notably from the others and is, each in its own way, adapted to agricultural utilization.

On the bare, rocky plateaus the rain water runs off in ephemeral torrents toward the Webi Shebeli and Juba. Some of these rainy-season torrents which have not yet eroded well defined valleys spread their waters over certain of the more level and uniform tracts, depositing here the alluvial matter with which they are loaded. Thus,

alongside the areas already mentioned as being covered with the eluvial products of weathering in place, there are formed other tracts blanketed by alluvium, where wells may be dug. These wells, however, while useful, never yield much water. The waters of the larger rivers, moreover, are not as yet available for use in the plateau zone; for this purpose they would have to be raised artificially to the requisite levels.

On the plateau the widespread areas of bare rock, the dry climate, and the scarcity of surface water have given rise to a sparse, poor, generally xerophytic vegetation. Trees are rare; scrub and grasslands, broken by completely bare tracts, predominate. A few small areas—where there is a detrital cover and the possibility of wells—are adapted to cultivation, as at Baidoa, or to pasture for cattle; but the greater part of the plateau is suited only to pasturing herds of camels. The reclamation and utilization of this zone for agricultural purposes appears difficult and costly and would probably yield a return on the investment only after a long term of years.

The zone of coastal dunes is quite different. Since it is close to the sea and includes the major centers of population of the colony, all of which are on the coast, it is of no little interest from the point of view of land utilization. Extending along the shore with a width varying from 4 kilometers to 100, but averaging about 25 kilometers, as at Afgoi, this zone is too large to be overlooked.

Within this dune province a distinction should be made between a narrower outer belt of bare, sterile, mobile sand hills useless for agriculture and a wider interior belt of old, more or less consolidated dunes thickly covered with dense acacia and prickly mimosa brush, dwarf trees, and a few baobabs (*Adansonia digitata*). Here during the rainy seasons a plentiful grassy growth springs up, which forms good pasture in the areas not covered with trees or scrub. For this reason the natives of the coastal centers keep their herds among the dunes throughout the whole year. Furthermore, herds from the alluvial plains are brought to the dunes during the rainy season when the former are under cultivation and malaria and the tsetse fly render them dangerous to man and beast.

In this zone of dunes, moreover, the rain water, easily absorbed by the sandy ground, accumulates beneath the more level areas in little water-bearing beds which may be tapped by wells, thus permitting a certain amount of farming to be carried on. For instance, kidney beans, watermelons, and other garden truck are grown, and even a little cotton.

The dune province is thus open to further development. It is particularly well adapted to selective reforestation and to the raising of specialized field crops. But it cannot attain any great economic importance.

The province or zone of the alluvial plain again presents entirely

different conditions. The alluvium, here, is fairly deep and at the surface frequently of fine texture. Nearly everywhere water-bearing beds permit the digging of wells; and the possibility of finding more abundant water in artesian wells should not be overlooked. The outstanding topographic characteristic of the plain is the fact that

FIG. 2—*Acacia regia* at Afgoi.

considerable areas of its surface stand at a lower level than that of the two great rivers. This makes irrigation possible at other times of the year than the seasons of flood.

The natural vegetation is of two completely divergent types: along the river banks there is a typical gallery forest with its dense growth of trees, underbrush, and creepers; elsewhere the vegetation is that of a steppe on which grasses spring up annually. In the steppe are found the best pastures of the colony, where many a herd of horned cattle graze. Most of the lands cultivated by the natives lie near the two rivers, but especially in the vicinity of the Webi Shebeli. The limited extent of these lands in the past and at the present time is to be explained by the sparseness of the population and the prevailing economic régime.

NATIVE POPULATION

The population of Italian Somalia is estimated at about 1,500,000 natives, unevenly distributed over an area of about 600,000 square kilometers. Not only is the population sparse, but it lacks homo-

geneity. If the lesser distinctions between races and tribes are not taken into account, three main groups may be recognized, from the economic point of view.

A mixed folk—Arab, Somali, Swahili, Bantu, Galla, Indian, etc.—is to be found in the small cities and villages along the coast,

FIG. 3—Coconut plantation at Genale.

engaged for the most part in trade, fishing, shipping, and minor domestic industries.

The principal group, Somali, are distributed over the whole region, with scattered representatives on the plateaus and among the dunes but the great majority on the alluvial plain. Although this group has a few fixed villages, most of its members live essentially a nomadic existence, moving with their herds of cattle from well to well and pasture to pasture. Like all pastoral people, the Somali have always looked with scorn upon life in the permanent settlements and labor in the fields. This work they used to leave to their slaves, who would raise what was necessary for their bare livelihood otherwise based essentially upon the products of the pastoral industry.

A population of freedmen, i. e. freed slaves of varied origin—Bantu, negroes, negroids—is permanently settled in farming villages, more especially in the vicinity of the Webi Shebeli. This group, which has been formed under the Italian colonial régime, does not include more than 200,000 individuals. Hence it is altogether too small to be of much use for the intensive and rapid reclamation of the whole alluvial plain province. It should be remembered, however,

that a part of the Somali group, the Rahanuin, estimated to number 500,000 souls, might be transformed without great difficulty from pastoral nomads into fixed agricultural settlers, although such a transformation could not be made rapidly.

FIG. 4—Kapok plantation at Genale.

NATIVE FARM PRACTICES

Some have believed that stock raising in Somalia could be developed along commercial lines. According to official statistics for 1929 the colony has about 1,100,000 head of cattle, 600,000 camels, and 855,000 sheep. In general they suffice the needs of native consumers only, although there is a limited export trade to Zanzibar. It has been proved, however, that further expansion of stock raising on a commercial scale would not be profitable, nor would it go far toward supplying the existing requirements of Italy, which annually imports about 230,000,000 lire's worth of fresh and preserved meat. Somalia, therefore, cannot well look forward to extensive development on other than agricultural lines. This agricultural development, however, naturally will have to be carried out by methods very different from those of the native farmers, who meet the local demand only.

Native farm practices are of three types, differing with the position of the fields in relation to the different reaches of the Webi Shebeli and Juba, i. e. according to whether the neighboring river remains at all times lower than that of the plain, or during floods rises higher than the plain, or is aggraded in the strict sense of the term.

Where the last is the case we have a type of farming known as *a stagni* from the term *à l'étang* that was applied by French rural

economists of the last century to such methods of cultivation in France. During the floods the river breaks out from its bed, and the water spreads extensively over the adjacent lowlands, where a film of fine fertile mud is deposited. When, towards December, the

FIG. 5—Casuarina grove at Genale.

floods subside and the inundated tracts dry up, the natives hasten there to plant crops. This type of farming is found along the lower courses both of the Webi Shebeli and Juba.

In the second case—i. e. where the river level is higher than the surrounding plain during periods of flood only—cultivation is carried on by means of irrigation, small canals being dug to lead the water from the river and distribute it over the fields. In the first case—where the level of the plain is at all times higher than that of the river—true dry farming is practiced, rain water alone being used.

The principal crop raised under the method of marsh or pond cultivation (*coltura a stagni*) is sesame. Where irrigation is practiced the crops are much more varied: sesame, durra, cotton, tobacco, ricinus, manioc, greens, lemons, and such tropical fruits as bananas, papaws, custard apples, and mangoes. The specialties of the dry-farming regions, most extensive of all in area, are dura, cotton, and kidney beans.

The uncertainty of dry farming, however, which is dependent on the rainfall, has led to a concentration of native agriculture in the immediate vicinity of the Webi Shebeli. Nor can we expect much further growth of native farming even here. Farming in Somalia must be lifted out of the simple and primitive condition in which

the natives practice it and, after a period of experimentation, be conducted along purely commercial lines. We have begun to see the situation in this light only very recently, but here alone lies hope for the future.

It is well to observe that Italy did not set foot in Somalia until 1889; in that year she established a partial protectorate and somewhat later acquired a partial leasehold. Not until 1905 was the region internationally recognized as an Italian possession, nor was it at that time wholly pacified. Indeed not until 1926 did the entire territory of the colony come under the uncontested control of the Italian crown. The pastoral nomads objected to Italian rule and to having a sedentary life forced upon them. The abolition of slavery was decreed in 1904. Although this created out of the class of freedmen a tolerably large number of agriculturists, it also went contrary to local tradition and irritated the Somali population, which felt—to some degree justifiably—that its age-old customs and economic standing were detrimentally affected. This all goes to show that only during the last few years has it been possible to speak of a movement toward better farming and toward settlement with commercial aims in view.

Agricultural Experiments

Beginning in 1906 a few attempts were made by private colonists to establish themselves on lands in the vicinity of the Juba and Webi Shebeli. Some of the settlers specialized in cotton, others in the raising of miscellaneous crops and particularly of fruits, for which they readily found a market in the coast towns and on passing steamers. The initiative was taken for the most part by individuals, or, if by a company, always with very little available capital. Failure was inevitable. The impossibility of farming except on a small scale and the total dependence of the harvests on the varying climatic conditions from year to year quickly led to discouragement and the abandonment of the small farms.

In 1912 the colonial government founded a great experimental estate at Genale, on the Webi Shebeli. Here for eight years—four of which were the years of the World War, a period particularly difficult for the Italian colonies—an intensive and continuous program of experimentation was carried out. The object was to select species of plants and animals that could be raised with the greatest profit under the local environmental conditions and to provide a model for the efficient conduct of commercial farming. The attempt was also made to establish settlements of Italian colonists, but these were doomed to failure because of the climate. More promising was the cultivation of the soil by the families of native freedmen under Italian supervision.

By the close of the World War the country was almost entirely pacified, but many attempts hitherto made at agricultural settlement had all come to naught. A background of experience, however, had been gained during this unfortunate period of failure and through the indispensable experiments in agronomy and animal husbandry carried

FIG. 6—Kapok plantation at Genale.

FIG. 7—Coconuts and bananas at Genale.

out at Genale. The time had at last come when a practical program of settlement could be put into effect without danger of the repetition of earlier misfortunes.

THE GENALE PROJECT

We are now in a position safely to prophesy the economic future of Italian Somalia. That we may do so is almost exclusively to the credit of a Prince long recognized for the courage with which he has undertaken hazardous enterprises: H. R. H. Luigi di Savoia, Duke of the Abruzzi, climber of Mts. St. Elias and Ruwenzori, once holder of the world's records for having reached farthest north in the Arctic and the highest altitude in the Himalaya. By his personal initiative the Duke founded and has directed an extensive agricultural project, which has served to reveal the economic possibilities of Italian Somalia and to provide an example for other projects of the same sort.

In 1920 the Prince selected a locality on the left bank of the Webi Shebeli a little above Afgoi, where he took a concession for a tract

of 25,000 hectares. Preliminary operations were immediately begun: these consisted of the digging of a system of irrigation canals; the clearing, breaking up, and leveling of the ground and division of it into cultivable units, or farms, each to be assigned to a single family.

Tugboats and barges were brought up the river; automobiles, farm machinery, and tractors were acquired; a village was built to

FIG. 8—Cottage of the personnel at Genale.

house the overseers; another for the mechanical outfit, and still others for the workmen. Meanwhile technical experts carried out ever more intensive experiments to find the plants and animals best adapted to local conditions. As soon as each field was prepared and irrigable, farm work was begun upon it. In 1925, only five years after ground had first been broken, 1400 families were working on the land.

Management of the holdings was not the least of the difficulties that had to be met; this difficulty, however, was happily overcome by the adoption of the following system. The directors of the estate grant to each native family a farm, consisting of one hectare of completely improved and irrigable land. The colonists are required to raise a moiety of food crops—Indian corn, durra, sesame, kidney beans, etc.—and a moiety of commercial crops, cotton, sesame, etc. The food crops are grown exclusively for benefit of the farmers; the commercial crops become the unrestricted possession of the estate, which directly takes charge of the elaboration whenever possible or desirable.

In principle this system raised doubts and difficulties. In practice it has proved efficient, primarily because it binds the farmer to the soil. In the last analysis, it is a special adaptation of the *mezzadria* system so widely prevalent under various forms in the Italian country-

side. The example set by the Duke of the Abruzzi led in 1924 to the adoption of an immense program of agricultural colonization on the experimental estate at Genale on the Webi Shebeli. Now that the period of experimentation had reached a close, the colonial government built a system of canals, prepared the ground, and opened it up to colonists.

FIG. 9—Colonist's house at Genale.

COMMERCIAL CROPS

An important commercial crop grown in Somalia is cotton. Although somewhat affected by parasites, the cotton plant thrives, producing an abundance of excellent white fiber. Among the many varieties upon which experiments have been made, long-fiber Egyptian cotton (*sakellaridis*) has given the best results. Each crop requires irrigation two or three times. Two months and a half after sowing the cotton begins to flower, and in five months the bolls reach maturity. From one quintal of cotton 34 kilograms of fiber and 60 kilograms of seed may be obtained. Under normal conditions the mean crop per hectare is 2.5 quintals of fiber and 4.5 of cleaned seeds. The seeds furnish about 15 per cent of their weight in oil and 65 per cent in cotton cake, an excellent feedstuff.

Not less important—perhaps more important, when one takes into consideration the fact that it can be raised with much less risk from parasites, etc.—is sugar cane (*Saccharum sinese*), of which the "striped ribbon," "white transparent," and Natal Uba varieties are grown. Sugar may be harvested eleven or twelve months after sowing and may be grown on the same fields three years in succession. After this, provided the soil be properly cleaned and plowed, cotton

may be substituted on the same plot. From each cutting about 500 quintals per hectare of stripped cane are obtained, which yield about 45 quintals of crystalized sugar.

Sesame is likewise profitable. If seeded in November or January, it is mature and ready for harvest eight months later. It has to be irrigated moderately twice during the first month, and certain precautions must be taken against insects and weeds. For this reason it is not advisable to sow the same field with sesame two years in succession. It yields about 8 quintals of seed per hectare, which, in turn, produce about 400 kilograms of excellent oil and slightly less in weight of fodder.

As an oil-giving plant the sunflower (*Helianthus annuus*) has also been introduced. This is valuable because it is easy to grow and gives a plentiful product. It takes three months to ripen and produces about 12 quintals of cleaned seed per hectare, from which may be extracted 18 per cent of the best quality of edible oil. As a fiber plant sisal (*Agave sisalana*) may be mentioned, for which there is a good market in Europe. This may be grown by dry-farming methods and occupies the soil for about ten years, yielding a good harvest of fiber after the beginning of the third year.

Along all the irrigation canals where there is a constant supply of water kapok trees (*Eriodendron anfractuosum*) and other woody plants are grown and serve to protect the fields. In the third year the kapok begins to put forth its first bolls and in the sixth is producing more than a kilogram of fiber per tree besides the oil in the seeds. The cultivation of the coconut palm has recently been introduced and ought to assume considerable importance.

These are the principal commercial crops. Certain other crops, however, are of significance either as yielding foodstuffs—Indian corn, durra, or fodder (*Vigna sinensis*, *Medicago sativa*, *Pennisetum purpureum*), the two latter being alternated with the first. There are, besides, many other commercial crops on which experiments are being made or the beginnings of practical exploitation attempted: the most promising of the fiber plants is Egyptian hemp (*Hibiscus cannabinus*); among the starchy plants, manioc and the sweet potato; among the ligneous plants, eucalyptus, casuarina, cassia, and bamboo; among fruit trees, banana, papaw, custard apple, citrus trees, and mango. In addition, there are all the various garden plants which, to a large extent meet the requirements of the colony for fresh vegetables and may be sold to passing vessels.

Thus we see that agriculture is rapidly developing as a fundamental element in the economic life of Italian Somalia. The colony has no mineral resources. Among other industries not directly related to agriculture there is only one of any account—that of the salt pans in the vicinity of Cape Guardafui. All the other industries

have sprung up as a result of recent developments in agriculture. We have in mind, for instance, a great sugar refinery; factories for the extraction of oil from cotton seed, sesame, and castor beans; oil refineries; and sawmills. Mention of tanneries, electrical power houses, and cotton-baling plants completes the record of this infant but healthily growing activity, alongside of which the domestic industries—matting, weaving, terra-cotta making, etc.—are also progressing. The increase in numbers and wealth of the natives is naturally reflected in a constant increase in the scope of their needs and desires. This development of the economic life of Italian Somalia has been followed by the movement of trade: in 1915 the annual value of the commerce of the colony was still below 8,000,000 lire, but by 1929 it had risen to the neighborhood of 200,000,000.

Limitations in Agricultural Development

Natural conditions impose two limitations on settlement in Italian Somalia. One is the scarcity of labor. The white peasant cannot become acclimatized, and, as has been pointed out, there are not many native laborers to draw upon. A few score thousand hectares placed under intensive cultivation would be enough to absorb the entire present agricultural population. In time and with increasing evidence at hand that profits may be made from farming, a large proportion of the Somali people may turn from the nomadic life to agriculture. And once this population has been absorbed, it may not be impossible to attract more immigrants from the regions whence came the original slave ancestors of the freedmen of the present day. However, this cannot be expected for a very long time to come.

The second limitation is the volume of flow of the principal rivers, Juba and Webi Shebeli. It is estimated that under present conditions the Webi Shebeli cannot be used for the reclamation of more than 150,000 and the Juba of more than 500,000 hectares. The Duke of the Abruzzi's observations during his recent expedition to the headwaters of the Webi showed that, if dams were built and other engineering operations carried out along the upper course of the river and its principal tributaries, the flow could be regulated, the quantity of water available for irrigation each year increased, and the area of the lands open to cultivation thus extended. From this point of view settlement is still a long way from reaching the limits imposed by nature.

It must, however, be recognized that such limits exist and the illusion must be avoided that Somalia can completely supply Italy with those colonial products now imported in great quantities from foreign countries. Nevertheless the economic future of the colony is hopeful, and Somalia will be in a position, at least in part, to bear its share of the economic burdens now resting on the mother country.

JOURNEYS IN NORTHERN ANATOLIA

Ernest Nowack

NORTHERN Anatolia includes the most inaccessible part of the peninsula. Only the coast is thickly settled because of the approach by sea and the existence of the country's single though important coal field, the Heraclea basin.[1] A few kilometers inland is a wilderness. Only a few routes penetrate far from the coast, and only one runs to the heart of the peninsula—that from Ineboli to Kastamuni and Angora. The entire culture and trade of the interior is concentrated in an east-to-west system of basins. They contain all the larger settlements of northern Anatolia, and along them in general run the trade routes. Before the building of the Anatolian railroad these caravan routes were of great importance, for at that time they carried the greater part of the transit trade from Constantinople to Armenia and Persia. With their decline the towns have declined too. So even in these most passable areas communications are still quite indifferent. Only the roads from Adabazar to Duzdje and Boli can be used by automobiles the year round. Otherwise the usual tilts (Turkish *araba*), horses, mules, asses are the means of communication; camels are only to be met with in the most southern regions.

The opening of the lately projected railways would put the valuable coal field in touch with the interior and would also permit adequate exploitation of timber resources unrivaled in the Near East—beech, fir, pine, and the less important oaks. There is also a modest wealth in minerals—small deposits of manganese, hematite, lead-silver ore, of which at present only a manganese mine near Eregli is in exploitation.

Scientific Travels

Actually this region remains very little known. Since the great journeys of the Russian scientist P. A. Tchihatcheff in the years 1847–1863, there has been no equally thorough investigation of the Anatolian peninsula of Asia Minor by a single individual. The travels of W. J. Hamilton (1835–1837), W. F. Ainsworth (1838–1839), and G. Perrot (1861–1862) also belong to this classical period of broad studies; but later only limited areas of the region have been the subject of geographical exploration. There is, for instance, the remarkable work by Alfred Philippson in western Asia Minor, 1900–1904, to

[1] The best description is Rally's "Le basin d'houiller d'Héraclé," *Annales Soc. Géol. de Belgique*, Vol. 23, Liége, 1895–96. More recent detailed study is needed.

which with its large-scale maps we are indebted for a detailed knowledge not matched elsewhere in the peninsula; and to which Walther Penck in his "Grundzüge der Geologie W-Kleinasiens," based on his journeys of 1917–1918, has added a further contribution. Taurus and Cilicia also are relatively well known as the results of the labors of the botanist Theodor Kotschy and the geologists F. X. Schaffer (1900–1901) and Fritz Frech (1911–1912). Still more recently and again thanks to Walther Penck, Werner Paeckelmann, and others we are quite well informed on the Bosporus and Bithynia. But as regards the rest of the country we can only gather general impressions from more or less popular travel narratives or from local researches of limited scope, more particularly those of the archeologists. Banse has summarized our knowledge of Anatolia as a whole in his excellent book on Turkey.[2]

Among the least-known parts of Asia Minor is the northern region, the ancient province of Paphlagonia, which has been crossed by but few scientific travelers. Tchihatcheff, Ainsworth, Anderson, Wrontschenko, Perrot, Diest indeed have visited parts of northern Anatolia, and this portion of Kiepert's map of Asia Minor (1 : 400,000) is based on their routes; but, with the exception of Tchihatcheff, in their writings we glean little as to the nature of the country. Leonhard (1899–1908) alone has made thorough explorations here, and to him we owe the clearest ideas of the topography and important contributions in the sphere of historical geography.[3] My own journeys in Anatolia made in 1926–1927 embrace the country between Angora (Ankara) and the Black Sea from Eregli (Heraclea Pontica) on the west to Samsun on the east. Apart from the routes over new ground these journeys show that we must revise considerably our ideas of the country as a whole.

Character of the Region as a Whole

Journeying across northern Anatolia from the Black Sea southward one passes through three clearly defined zones, different in physiography and climate, in vegetation and settlement. The maritime zone is a mountainous country of strong relief, dissected by deep ravines and gullies, very humid, covered with a luxuriant vegetation, the typical "Colchian wood,"[4] and well populated on its seaward borders.

[2] Ewald Banse: Die Türkei: Eine moderne Geographie, Brunswick, 1915. A review of this work (3rd edit., 1919) by Ellen Churchill Semple appeared in the *Geogr. Rev.*, Vol. 11, 1921, pp. 338–350.

[3] Richard Leonhard: Paphlagonia, Reisen und Forschungen im nördlichen Kleinasien, Berlin, 1915.

[4] The most characteristic forms of the Colchian coast, to use the ancient term, are *Carpinus betulus, Castanea sativa, Rhododendron ponticum, R. flavum, Vaccinium arctostaphilos, Daphne pontica.* On the vegetation and phytogeographical problems see Ernst Nowack and Friedrich Markgraf: Die Grenze zwischen der kolchischen Waldvegetation und der Hochlandsvegetation im nördlichen Kleinasien, *Die Naturwissenschaften*, Vol. 16, 1928, pp. 753–757; and Markgraf: Plantae Anatolicae Nowackianae, *Repert. spec. nov. regni veget.*, Vol. 10, Berlin, 1928.

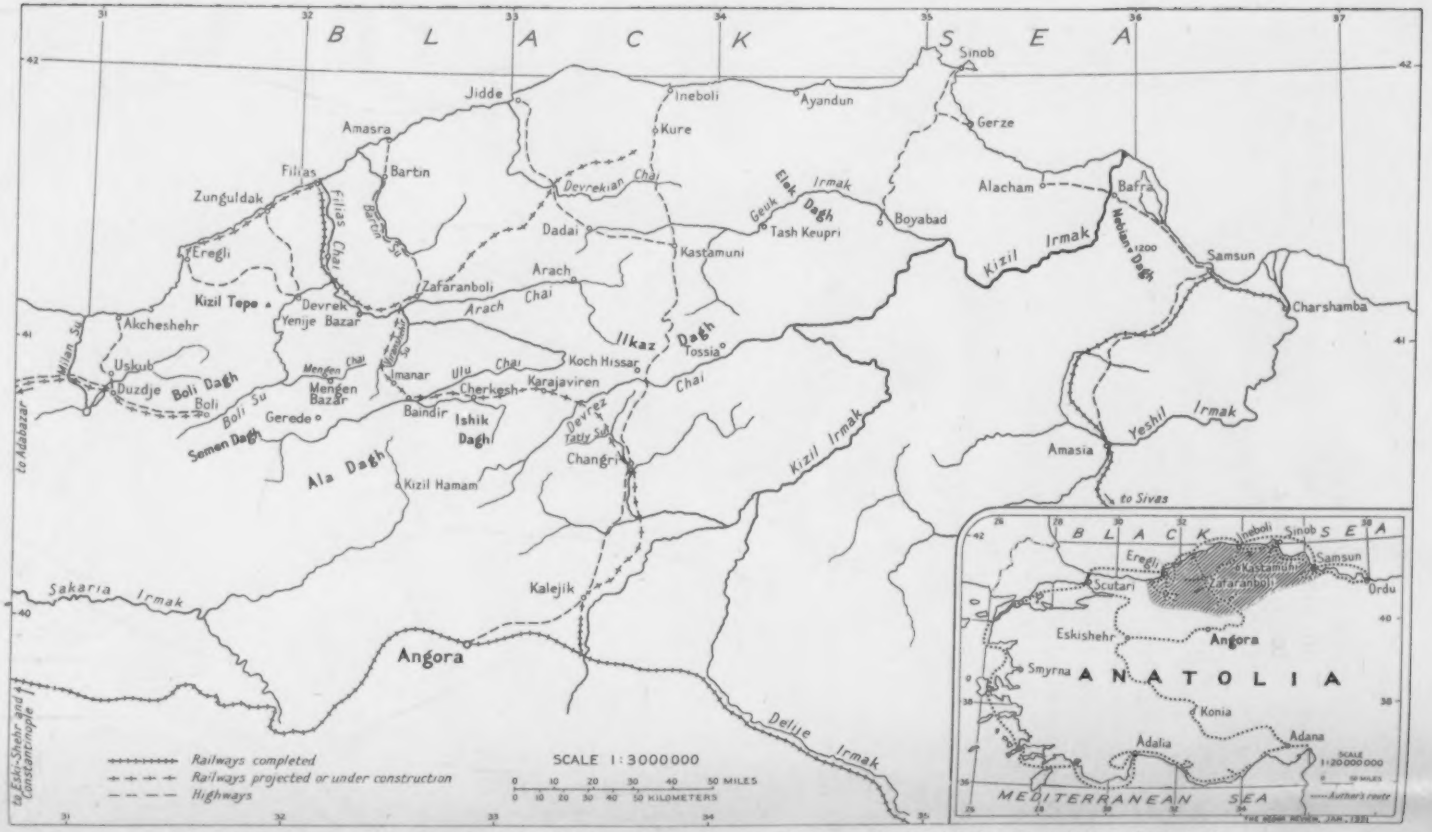

FIG. 1—Map of a part of northern Anatolia. The inset shows the extent of the area discussed in the text and the author's route.

The succeeding transition zone is predominantly an upland with depressed basins, *ovas*, in an east-west line, dissected by a few deep valleys and with mountain chains running east and west. The valleys and northern slopes of the ranges feel the influence of the humid winds from the sea, and in these favored places woods of Colchian character are still to be seen. By contrast the peneplaned surfaces, now elevated to form uplands, bear at the best coniferous trees or, more commonly, treeless steppes. The interior of the basins and the southern slopes of the ranges lie almost entirely beyond the influence of the mild and moist sea air. The basins stretching east to west are seats of settlement and highways of communication.

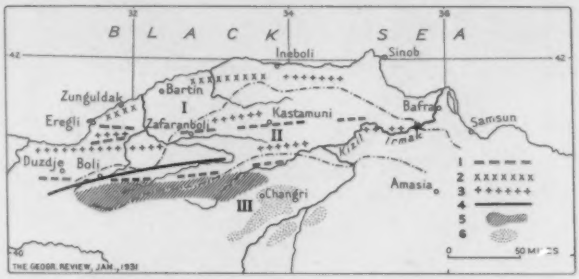

FIG. 2—Zones and structure map of northern Anatolia. Numbers have reference: I, Maritime Zone; II, Transition Zone; III, Interior Upland Zone; 1, synclinal regions of Neogene fold system, mostly Eocene or Cretaceous; 2, anticlinal regions of productive Carboniferous; 3, anticlinal regions of older Paleozoics; 4, Paphlagonian line; 5, Galatian andesitic massifs; 6, inland Miocene deposits.

The inner upland is an uplifted and warped peneplain of an average elevation of 1000 to 2000 meters with some isolated monadnocks and mosores and with flat valleys and shallow basins, arid and supporting a steppe vegetation and scanty settlement.

The width of the first two zones varies. Where dissection has proceeded far inland along the larger stream valleys the maritime zone is broader; where no large river enters the sea the upland of the transition zone is relatively near the coast. To appreciate this fact we must examine the peninsula as a whole.

Anatolia is a foursquare block of land, much dismembered in the west, where it disintegrates into a chaos of islands and peninsulas, and forming a compact upland in the east with north and south bordering mountain ranges, which cut off the interior from moisture-bearing winds and make it semidesert. Recent great uplift is shown by the occurrence of large areas of marine Miocene deposits at an elevation of 3000 meters in the Taurus system corresponding with contemporaneous lacustrine deposits in the interior. Drainage is not yet adapted to this uplift. Headward erosion of the rivers on the outer slopes is eating into the block, but the upraised rim[5] is a bar to progress. However, in the northern part of central Anatolia an old east-to-west system has been captured by the youthful Black Sea drainage. The old system is directed by the system of Neogene folding with which

[5] From my viewpoint Anatolia may be considered the center of a great eddy of folding.

FIG. 1—Map of a part of northern Anatolia. The inset shows the extent of the area discussed in the text and the author's route.

FIG. 3—Eregli, the ancient Heraclea.

volcanic outbreak was associated along a system of east-west fissures.[6] Only the southern part of the upland interior is without drainage to the sea, retaining its Miocene lacustrine characteristics. Its hydrographic evolution is one of the most interesting morphological problems of Anatolia.

As a consequence of uplift and revived erosion the humid oceanic climate and hygrophilous vegetation is advancing towards the heart of the upland. The three zones represent stages in this advancement: the first zone, entirely under the sway of the revived erosion, is occupied by Colchian vegetation; the second, partially so affected, carries Colchian vegetation in the young valleys; the third zone, without this influence, shows the uplifted block intact.

The system of basins has already been mentioned as a characteristic of the second zone. One of the most typical series begins on the deeply embayed Gulf of Ismid in the west and is defined by the towns of Adabazar, Duzdje, Boli, Gerede, Cherkesh. Northward a parallel row of basins runs from Zafaranboli, Arach, Kastamuni, Boyabad. They correspond with the synclines of the Neogene folding, first noted in western Asia Minor by Walther Penck[7] and afterwards traced farther eastward by myself. But faulting has also played a part in the formation of the basins; characteristically the boundary of at least one side of a basin is constituted by a fault. For the most part older Tertiary deposits (nummulitic sandstones and marl) or Upper Cretaceous (Gosau facies) are exposed in the basins, while between the basin systems are seen old Paleozoics overlying crystallines and exhibiting quite different tectonic structure. These are remnants of the Variscan mountain system formerly running nearly north to south through the peninsula. Near the coast, Carboniferous and Lower Cretaceous (Urgonian) are involved in the older folding while Upper Cretaceous (Senonian) and Eocene constitute the less

[6] E. Nowack: Die wichtigsten Ergebnisse meiner anatolischen Reisen, *Zeitschr. Deutsch. Geol. Gesell.* (*Monatsber.*), Vol. 80, 1928, pp. 304–312.

[7] Walther Penck: Die tektonischen Grundzüge Westkleinasiens, Stuttgart, 1918.

FIG. 4—Akcheshehr, port for the Duzdje and Boli districts.

intensively disturbed uppermost strata. Farther inland, south of a major line of disturbance characterized by intensive deformation, which I call the Paphlagonian line, the understructure consists of old folded Paleozoics and metamorphics mainly Jurassic in age composing a serpentine-limestone-flint series, heretofore best known from the Balkan Peninsula.[8] The upper strata in these southern regions are Upper Cretaceous (Gosau facies) and Tertiary (especially inland Miocene).

I believe that the Pontic folded chains north of the Paphlagonian line are the continuation of the fold system of the Balkans, the intermediate section being sunk beneath the Black Sea; while the southern region, the Paphlagonian-Galatian fold system, represents a continuation of the Dinarics. Along the shatter belt of the Paphlagonian line the two groups of folds have moved side by side in a zone of violent dislocation.

Younger Tertiary and Quaternary eruptions of andesitic lavas play an important part in the structure of northern Anatolia. South of the Paphlagonian line they compose great mountain massifs (Galatian Andesitic Massif)[9]. Younger volcanic activity is likewise probably closely associated with the tectonic happenings in the northern Anatolian virgation.

Natural Regions: The Maritime Country

ZUNGULDAK AND ITS HINTERLAND

Zunguldak, now capital of the vilayet, is by far the most important port on the western part of the Black Sea coast, outranking Eregli (Heraclea), the old center. Its prosperity is based on the coal mines. The site on a small bay open to the north is unfavorable, necessitating much work on the harbor, which even now cannot be entered for days

[8] Ernest Nowack: A Contribution to the Geography of Albania, *Geogr. Rev.*, Vol. 11, 1921, pp. 503–540.

[9] Leonhard, *op. cit.*

FIG. 5

FIG. 6

FIG. 7

FIG. 5—A west Pontic village between Eregli and Devrek.

FIG. 6—Wooded mountains in the Eregli hinterland. The Aju Kaja (bear rock), nearly 2000 meters high.

FIG. 7—Yenibazar, a small market town in the Jidde hinterland. Pontic house types.

at a stretch in winter when the sea is rough. The mines yield nearly one million tons of coal, and almost the entire quantity is exported to Constantinople. The greater part is consumed in Turkey, the remainder, about 100,000 tons, being used for bunkers of the Black Sea ports. The mines in the vicinity of Zunguldak are susceptible of considerable expansion; 24 exploitable seams with a total thickness of 30 to 40 meters of coal have been proved in an area 40 kilometers by 4 kilometers in extent. The industry suffers through the conditions under which it is prosecuted. There are no trained miners, the number of workers is insufficient, the methods employed are irrational; hence the price is so high that the coal can barely compete with the English importation. Concession holders are French and Turkish.

The rocky limestone (Cretaceous) coast of Zunguldak is clothed with a luxuriant evergreen shrub vegetation—the bay tree, myrtle, tree heath, holm oak, strawberry tree, phillyrea, rhododendron (*Rhododendron ponticum* and *Rhododendron flavum*) are the chief representatives. The slopes are steep; the heights, rising to nearly 500

meters, are dissected out of a peneplain. There are also remnants of an earlier cycle of erosion, with which are associated the settlements where wheat and maize are grown and some flax and millet. A road passable in the dry season leads across the mountain to Devrek in the Boli Valley, a little town of almost untouched oriental charm and a local center.

FIG. 8—The Ineboli-Kastamuni road near Kure.

EREGLI AND ITS HINTERLAND

Eregli, the ancient Heraclea, lying in the amphitheater of a large bay sheltered to the north, is one of the most beautiful seaboard towns of Anatolia. Through the loss of its numerous Greek population it is now largely depopulated, though it still is an important refuge for Black Sea shipping in stormy weather. Construction of the projected harbor improvements and the building of the Angora-Eregli railroad (see Fig. 1) should revive the town (Fig. 3).

Near Eregli the hinterland opens a little, for here one of the Neogene synclines reaches the sea. The 500 to 700 meter-high peneplain of Zunguldak, almost completely dissected, is here lowered nearly to sea level and for the most part has been preserved; and above it rise rounded monadnocks, covered with a bushy vegetation. In the Cretaceous and Eocene strata to the east there is a road to Devrek, not yet finished and good only in the dry season; but to the west there is a bar to travel in the Kizil Tepe Mountains (1600 meters) a high range of old folded Paleozoics brought up by an anticline. Typical Colchian primeval forest flourishes on the northern slopes: beech and sweet chestnut with a dense undergrowth of rhododendron, heath, and blueberry reach up to 1000 meters and at greater elevations are replaced by conifers, especially *Abies bornmuelleriana;* while on the southern side predominate oaks with an undergrowth of juniper.

Opposite Kizil Tepe is another broad flat synclinal depression marked by Eocene deposits. For the most part it is wooded and scantily populated and drains to the Duzdje basin by the Milan Su.

The succeeding anticlinal range of Paleozoics and metamorphics forms the divide with the Boli basin. The highest summits reach an elevation of nearly 2000 meters (Aju Kaja, Elemen Dagh). Here again the rainy northern slopes are covered with thick forest of beech and rhododendron.

The economic wealth of the Eregli hinterland lies in its forests, quite unexploited up to now. The hematite in the Devonian of Kizil Tepe in spite of its high iron content is not abundant enough for economic value. On the contrary the manganese ore (psilomelane and pyrolusite) at the contact of the andesites and the Cretaceous and Eocene marls holds much promise. One mine in operation near the village of Kepez, six kilometers from Eregli, yields 100 tons of ore a month; the ore is carried by motor truck to Eregli and thence shipped to Rotterdam.

Akcheshehr and Its Hinterland

Between Eregli and the small coast town of Akcheshehr the Paleozoics of Kizil Tepe approach the sea for a short space effectually separating the two districts. Wretched mule tracks are the only roads across the mountain spurs.

About Akcheshehr itself there is a narrow foreland of Cretaceous marl, topped by a low terrace and representing a recently uplifted coastal plain. Akcheshehr is the local port for Uskub, Duzdje, and Boli, exporting some lumber, field crops of the interior basins, and hazelnuts. A very poor road, mostly used by buffalo carts, leads across a steep wooded ascent to Duzdje.

The basin of Duzdje, surrounded by forest-clad mountains, thanks to the deep depression of the coast range here, is open to maritime influences. The central town Duzdje has a prosperous tobacco cultivation. Uskub, as revealed by its ruins, was an important settlement of antiquity.

Bartin, Amasra, and Hinterland

Eastward from Zunguldak the coast remains steep, though the bold cliffs of hard rudistan limestone give place to Cretaceous flysch. The broad valley of the Filias Chai is excavated in the soft flysch. Farther east the town of Bartin is situated in a wide tectonic depression. It represents the only river harbor on the Anatolian coast and flourishes through its timber trade. The centripetal drainage of the region shows a recent depression, and it is because of this that Bartin can be reached by sea-going vessels.

A passable road connects Bartin with the picturesque little town of Amasra. Amasra has a future in the coal measures brought up in an anticline and extending for 100 kilometers to Kure in the hinter-

land of Ineboli. At present no workings exist in this virtually unexplored field. It is planned to open it up with a branch line from the projected Angora-Eregli railroad.

The surroundings of Bartin and Amasra are well populated and well cultivated. They send poultry, eggs, fruits, and vegetables to Constantinople for exportation.

FIG. 9—Bartin, the only river harbor on the coast of northern Anatolia.

About 20 kilometers inland there rises the lofty, rugged, and wooded range whence Bartin obtains its lumber—beech and fir. A passable road crosses the range at an elevation of 1200 meters to connect with Zafaranboli.

INEBOLI AND ITS SURROUNDINGS

East of Amasra in the vicinity of Jidde a rocky mountain range (Lower Cretaceous limestone) approaching the coast gives rise to most effective scenery but shuts off the interior from the seaboard. Only near Ineboli is the rugged character softened. Beyond Ineboli, though the mountains resume their steepness, advantage is taken of the flat remnants of old peneplains at various levels for the siting of villages or farms. Excellent fruits are produced. From Ineboli apples and grapes are exported, and *tiftik* (Angora goat hair) and wood from the interior.

Ineboli, situated at the mouth of a narrow river valley, is the port for the important town of Kastamuni, seat of the government of the vilayet, and as such is touched by passenger boats in the Turkish steamer service. It is connected with Kastamuni by a well constructed road. Kastamuni on its part is connected with Angora via Changri.

FIG. 10—Sinob, looking to the south.

The harbor of Ineboli is completely lacking in shelter and cannot be entered in bad weather. About 20 kilometers up country on the road to Kastamuni is the old copper-mining town of Kure, its resources now exhausted.

Erosion in this section of the maritime zone has not proceeded very far into the interior. The old undissected peneplain on the Paleozoics of the interior is encountered 30 kilometers from Ineboli. But precipitation is still considerable here, and the upland is well settled.

THE COAST BETWEEN INEBOLI AND SINOB

Though the coast retains its steep character nearly up to Sinob, it is well populated. At the mouth of every larger valley is a small harbor occupied in the wood trade. The exploitable forest, beech, chestnut, fir, begins at an elevation of 600 to 800 meters above the zone of evergreen bushy wood and two to three hours distant from the sea. Manganese ore occurs at the contact of andesite and Cretaceous flysch; its possibilities have been imperfectly explored; but the ore is siliceous, and the quantity probably is not large.

The most important settlement along this coast is Ayandun at the mouth of the small river of that name, where the mountains are lower and the Cretaceous flysch extends farther inland. A road crosses the mountains to Tashkeupri, and a cable railway for the transportation of wood is being built. It is the only improvement of its kind that I saw on the whole of the Black Sea coast of Anatolia.

SINOB AND ITS HINTERLAND

Sinob is very attractively situated on the narrow isthmus of a claviform peninsula. It has the best natural harbor on the coast; hence its great importance in antiquity and the Middle Ages. Imposing fortifications still bear witness to these splendid periods. Today

FIG. 11—Samsun, looking to the east.

Sinob is almost depopulated, for it lacks a hinterland of economic importance and has lost its former Greek inhabitants. Zunguldak in the west and Samsun in the east monopolize trade. Very recently, however, a match factory has been established and may represent the beginning of a revival of the town.

The whole breadth of the Sinob Peninsula is occupied by a low pleasant hill country in marine Pliocene. It is not as well populated as its fertility and mild climate—here the olive flourishes—would lead one to expect; probably it is suffering from the recent exodus of the Greeks. A comparatively good but little-used road connects Sinob with Boyabad in the interior.

THE COAST BETWEEN SINOB AND THE KIZIL IRMAK DELTA

The broad hill foreland about Sinob narrows continuously to Gerze, where high mountains again approach the coast directly. Gerze on a small sheltered bay flourishes on the export of farm produce, especially eggs. The cultivation of tobacco, here seen for the first time in the maritime zone, becomes of increasing importance eastward.

The Sinob-Gerze district is completely cut off from the Kizil Irmak delta by impassable cliffs 30 kilometers south of Gerze. A difficult mule track going far into the interior connects the two provinces. The building of a not too promising road has commenced.

THE KIZIL IRMAK DELTA AND INTERIOR

By far the greater part of the Kizil Irmak delta is not yet populated but is occupied by a parklike grassland, swampy woods, and lagoons. Only near the mountain border in the neighborhood of the small town of Alacham and at Bafra, where the river leaves the mountains, is the land cultivated and here for tobacco and maize. Tobacco brings

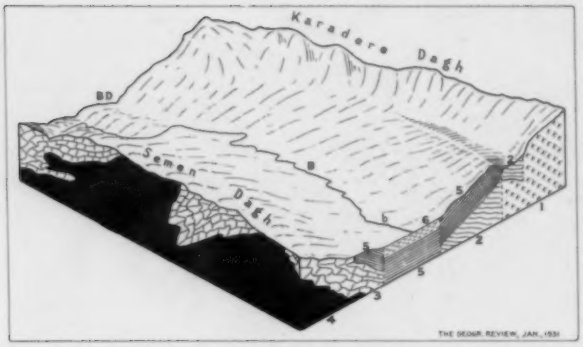

FIG. 12—Block diagram of the Boli basin region viewed from the southeast. Numbers and letters have reference: 1, crystalline rocks; 2, Paleozoics; 3, Jurassic; 4, andesites; 5, Eocene; 6, Neogene and Quaternary; B, Boli; BD, Boli Dagh (pass to Duzdje and Adabazar); b, Boli Su.

considerable wealth to Bafra, though no one would suspect it from the state of the town. The long wooden bridge across the Kizil Irmak is in a dangerous state of dilapidation: only the numerous grog-shops indicate that there is money to be spent. A well constructed but uncompleted road leads to Samsun, a poor one to Alacham. It is the only road along the whole western Black Sea coast.

The Kizil Irmak with its wide, waste-filled bed can be navigated only by small vessels coming downstream with market produce. The amount of water in this greatest river of Asia Minor is so small in summer that it can easily be forded here near its mouth. About 30 kilometers upstream from Bafra it breaks through the Cretaceous flysch mountains, coming through a narrow gorge eroded in Paleozoic limestones, slates, and sandstones.

East of the valley of the Kizil Irmak rises Nebian Dagh, a Tertiary volcanic massif with a sharp peak 1200 meters high and visible for a great distance. The flysch land with an average height of 500 meters is covered with oak woods and grass, the pasture grounds of numerous flocks of sheep, whose nomadic owners pitch their tents here during the summer season. Only mule tracks lead into the interior.

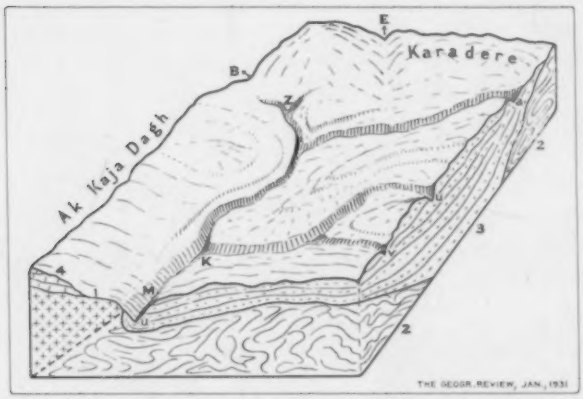

FIG. 13—Block diagram of the Zafaranboli region viewed from the southwest. Numbers and letters have reference: 1, crystalline rocks; 2, folded Paleozoics; 3, Eocene; Z, Zafaranboli; M, Melisse (beginning of the gorge of the Ulu Chai); K, Karabuk (confluence of Ulu Chai and Arach Chai); B, to Bartin; E, to Eflani; a, Arach Chai; u, Ulu Chai; v, Viranshehir Su.

Along the road to Samsun are no settlements; the land is uncultivated and is parklike in appearance. Not till within eight kil-

ometers of Samsun does agriculture—wheat and tobacco—begin. A sand-and-gravel terrace at a height of 50 meters, similar to that near Bafra, fronts the Cretaceous flysch mountains; and there are not wanting signs of pronounced recent uplift continued up to the present time.

Samsun and Its Hinterland

Samsun is on the way to becoming the most important port of the entire Black Sea coast of Anatolia. Though possessing little natural shelter, its harbor is being cleverly improved. It is the chief port for the export of tobacco, and the town has a tobacco factory and a professional school for tobacco cultivators. But above all it is the outlet for a large district of the Anatolian interior. Completion of the standard-gauge railway, now opened beyond Amasia and in construction to Sivas, will shortly connect Samsun with the main Anatolian system.[10] The Sivas-Angora line has been opened lately. Moreover, a narrow-gauge line connects Samsun with Charshamba, a market town in the well cultivated lowland of the delta of the Yeshil Irmak.

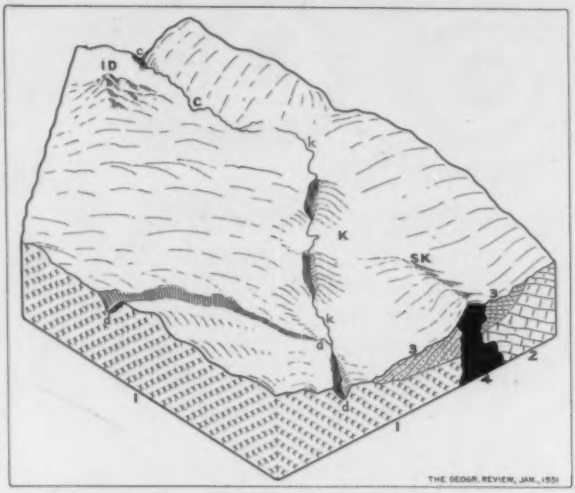

Fig. 14—Block diagram of the Cherkesh and Karajaviran (andesitic upland). Numbers and letters have reference: 1, older andesitic lavas; 2, Cretaceous; 3, volcanics (tuffs, ashes, etc.); 4, younger andesitic lava (Pliocene or Pleistocene); C, Cherkesh; K, Karajaviran; ID, Ishik Dagh; SK, Sari Kaja; c, Cherkesh Su; d, Devrez Chai; k, Karajaviran Su.

About Samsun a tectonic depression in the Pontic Coast Range accounts for the comparative accessibility to the interior and the site of the town. The relatively inconsiderable uplift of the land means that the revival of valley erosion has not proceeded far into the interior. Some 36 kilometers above Samsun the old flat-floored valley and the upland with its broad remnants of peneplain and shallow *ovas* are seen. The interior lacks the Colchian rain forest not only because the mountain wall is wanting but because this district, anciently populous, has suffered deforestation.

[10] According to the latest information available (U. S. Dept. of Commerce, *Foreign Railway News*, Sept. 9, 1930) the line has now been opened to Kunduz, 288 kilometers from Samsun.

The Transition Zone

Boli Basin and Surroundings

South of the synclinal highland of Jilja rises an anticlinal element in the paleozoic-metamorphic mountains of Karadere. These moun-

Fig. 15—Valley of the Ulu Chai near Akbash, north of Cherkesh.

tains, with generally subdued forms rising to heights of 2000 meters, constitute the northern border of the Boli basin (Fig. 12). They are covered by a dense forest, largely of conifers. The once peneplaned surface, now completely dissected in the Karadere, is steeply inclined in the Boli basin as a consequence of faulting. South of the basin the peneplain, in a far better state of preservation, rises and at length is overtopped by the young volcanic deposits of the Ala Dagh (nearly 2300 meters). The geological structure of this southern upland is quite different from that of the north: besides young eruptives (andesites, porphyrites) there appears a great thickness of Jurassic rocks intensely disturbed. Along the longitudinal axis of the basin runs the great tectonic divide between the Pontic and the Paphlagonian-Galatian fold ranges.

To the west the boundary of the Boli Dagh divides the Boli basin from that of Duzdje already described. Up to the summit of the pass the Colchian woods flourish, beyond they disappear. Only in the higher parts of the southern ranges do we find isolated woodland outposts.

On the flat floor of the basin at an elevation of 740 meters above sea level grain is cultivated for export, but the chief product of the district is wood. The forests of Karadere still contain immense stands

overlain with Devonian (coral-rag, slates, and graywacke), while

of scarcely touched timber; and the southern uplands, Ala Dagh, Semen Dagh, also have extensive coniferous woods. Lumbering is still primitive, and transportation is unorganized. Only one road leads over the Boli Dagh to Duzdje and thence to the coast or to Adabazar on the Anatolian railroad, and it is poor and scarcely pass-

FIG. 16—Masturen, village north of Changri on the andesitic upland. Here appear Pontic house types—wood house with veranda and tiled roof.

able during the rainy season. The ten-year-old project of a branch railway line from the main line has not yet been realized.

Boli itself is a very old settlement (Bithynium Claudiopolis), but it possesses few remains of antiquity. The site of the acropolis on a low hill in the eastern part of the town is now occupied by a school building. The town is growing but preserves its oriental character for the most part, as may well be seen on crowded market days. Some attempts have been made at modernization. Boli has electric light generated by a wood-burning steam engine, and there is a good lignite coal near the town. Some day this coal field will be a valuable asset, and so will the medicinal sulphur springs when once the railway project is realized. Boli is evidently destined to be the center of a wood-working industry.

THE MOUNTAINOUS COUNTRY BETWEEN BOLI SU AND VIRANSHEHIR SU

Between the deep valley of the meandering Boli Su and the next valley eastward, the Viranshehir, is a dissected forested mountainous country that continues northward to form the western border of the Zafaranboli basin. The crystalline core of the mountains is here

is asymmetric, the lowest part occupied by the Arach Valley lying

overlain with Devonian (coral-rag, slates, and graywacke), while in the east appear Eocene sandstones and marls.

The Ulu Chai, the largest river between the Sakaria on the west and the Kizil Irmak on the east, has cut through the crystallines a defile difficult of access and heretofore unknown. The narrow gorge commences about six kilometers below the junction of the Arach Chai. It is passable only at the low water stage by following the stream bed. I traversed the entire extent of the gorge up and down and made a topographic sketch of its course (Fig. 17). In the gorge on high terraces is a tiny settlement on either bank.

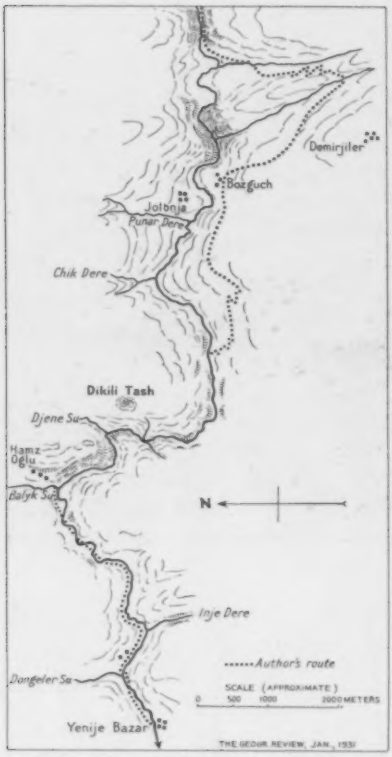

FIG. 17—Gorge of the Ulu Chai near Yenijebazar. Route sketch by the author.

The woodland area between Boli Su and Viranshehir Su is scantily populated. Only in the neighborhood of Mengen Chai are villages numerous, and Bazar Mengen is the only market of this region. This settlement in its encompassing woods seems to be the relic of an old resistant population of Indo-germanic origin. The people are distinguished by their reddish-fair hair and light blue eyes. Houses and chalets are reminiscent of alpine buildings. The rank growth of herbaceous plants and grass under the beeches and conifers suggests the central European forest; only isolated Colchian species are interspersed. Here again are unexploited riches in timber that could be made accessible from Boli.

BASIN OF ZAFARANBOLI

The basin of Zafaranboli presents a different aspect (Fig. 13). While the Boli basin was formed by a late process of depression (Neogene to Quaternary) associated with faulting, Zafaranboli occupies a geosyncline. As a consequence the Eocene beds largely eroded in other districts have been well preserved in the Zafaranboli basin. On the northern border, where Paleozoics and Cretaceous partially overthrust the Eocene, the latter are sharply tilted; but on the southern border the strata incline at a moderate angle. The geosyncline

operations are carried on. Besides tanneries the manufacture of

is asymmetric, the lowest part occupied by the Arach Valley lying close to the northern border. It is not yet known how far the Eocene extends eastward. According to Tchihatcheff it extends as far as Arach, but the syncline seems to narrow considerably in this direction.

Northeast towards Dadai, near Kastamuni, stretches a thinly populated woodland of moderate elevation cut in the downsunken

FIG. 18—Entrance to the great gorge of Filias Chai below Karabuk.

peneplain. It is the region of the Karadere, a right-hand tributary of the Arach Chai, and the Devrikian Chai, which enters the Black Sea near Jidde. Only about the divide at an altitude of 1200 meters are remnants of the peneplain preserved intact, and even here the younger deposits have been removed. These areas are the most thickly settled and best cultivated.

The northern slopes of the northern border of the Zafaranboli basin are wooded; and in the deep valleys of the south we find outposts of the Colchian vegetation, but the basin itself is woodless and characterized by an extreme climate. The hot summers encourage an intensive horticulture and the growing of grapes and rice. The grapes of Zafaranboli, famed throughout northern Anatolia, ripen at the end of July. Garden produce and fruits are exported not only to the seaboard but into the rugged interior. The cultivation of saffron, whence the town took its name, formerly had a large place in the economy of the region but today has declined to nothing. On the contrary the cultivation of cotton is proving very successful.

Zafaranboli itself is characteristically situated on the upland border of the depressed zone, and the area about the town is much cut by gorges in which during the summer season of low water tanning

operations are carried on. Besides tanneries the manufacture of printed cloth flourishes. The market with its fruits and garden produce is a pleasing sight, and several magnificent mosques and the narrow bazar arcades shaded by grapevines make a truly oriental picture. Since the expulsion of the Greeks and Armenians the population, however, has been much reduced.

FIG. 19—Sinter cone of Imanar in the Cherkesh upland, seen from the west.

The only communication Zafaranboli has to the north is to Bartin, whence in the good season is a regular stream of traffic. Eastward to Kastamuni and south to Angora are unimportant caravan routes. Zafaranboli will profit greatly by the building of the Angora-Eregli-Zafaranboli line. A branch also should be run through the wooded country of the Karadere to Soyd Usu, back of Jidde, where coal is known to exist.

UPLAND OF CHERKESH

South of Zafaranboli we come to a region where the undissected upland is dominant. The youthful erosion of the Ulu Chai system extends as far as the depressed zone in which lies Cherkesh and which is a continuation of the depressed zones of Boli and Gerede. Some kilometers below Cherkesh the valley shows the characteristically flat open form of the upland. The boundary line is very sharp and is emphasized by the vegetation. In the recently dissected valleys a shrubby vegetation rich in species—hazelnut, hornbeam, dogwood, etc.—has place, while in the open plains of the upland the vegetation is of steppe character.

Morphologically the Cherkesh zone appears to be a broad open valley, but of its tectonic origin there is no doubt. The scarcely perceptible divide between the Ulu Chai and Kizil Irmak runs through the zone. Northward ranges of Cretaceous marls and southward ranges of andesitic lavas rise to the common level of the peneplain

of 1400 meters, while the valley itself has an altitude of 1100 to 1200

FIG. 20

FIG. 21

FIG. 22

FIG. 23

FIGS. 20–23—The Kizil Irmak. Figure 20 shows the river leaving its gorge in the Paleozoics 30 kilometers upstream from Bafra. Figures 21 and 22 show the upland plain of the Kizil Irmak at Hamzaly (south of Changri). Figure 23 shows the first section camp of the Swedish railroad engineers at Kalejik.

of 1400 meters, while the valley itself has an altitude of 1100 to 1200 meters. In the south only the conical andesitic peak of Ishik Dagh overtops the peneplain level and supports an outpost of Colchian vegetation (Fig. 14).

North of the Ulu Chai near Baindir, where the saucer-shaped depression of the upland is sunk some 300 meters, there rises a prominent landmark in the shape of a conical peak 70 meters high. This is a mass of white sinter deposited by the hot sulphur springs of Imanar, which like those of Boli are associated with the Paphalagonian line.

The climate of the Cherkesh upland is rude, for the land lies entirely at an elevation of over 1000 meters. Fruits are not grown, but grain does well in the Cherkesh Valley. The most important phase of rural economy is the rearing of Angora goats and poultry. The density of population is 11 to 20 per square kilometer.

Cherkesh has declined since the building of the Anatolian railway and now serves only as a local market, though large caravansaries and a beautiful mosque still testify to its former importance as a junction of routes. Farther east Karajaviran is a rising place, while to the west Yenije Bazar is the center of the thickly settled area of the upper Viranshehir, the most productive part of the region.

In spite of its high elevation the upland of Cherkesh is capable of agricultural and natural development which will be encouraged by the construction of the Angora-Eregli railroad. Economic minerals are limited to the occurrence of magnesite with serpentine, deposits worth investigating once the railroad is opened.

Upland between Devrez Chai and Geuk Irmak with Ilkaz Dagh

This central part of northern Anatolia is least known and least accessible. It is open only along the road to Kastamuni, and I myself got only a little insight into the region.

Presumably east of the elbow of the Ulu Chai the axis of a geanticline exposes old crystallines and breaks the monotony of the upland. It probably explains the elbow of the river turned sharply back to the west. Uplift apparently progressed slowly, and the new cycle of erosion initiated is already in an advanced stage. The mountains rise to 2300 meters, and the forms are decidedly subdued though slopes are relatively steep. Overtopping the general level of the upland at 1000 meters is a thick growth of coniferous wood; the ridge itself extends beyond the tree limit. To the north, stretching to Kastamuni, is an arid denuded foreland zone in Eocene limestone and sandstones—apparently a continuation of the geosyncline of Zafaranboli.

The whole area is thinly settled and, except for the woods of the Ilkaz Dagh and the Elek Dagh to the east, is without economic resources. Only the borders south (Devrez Chai) and north (depressed zone of Kastamuni) are of agricultural value; and here grapes and other fruits are produced abundantly with maize and rice of excellent quality, while pastoral pursuits are of prime importance. Kastamuni, with about 40,000 population, is the chief city of northern Anatolia but is ill favored in its extreme climate and the charmlessness of its arid surroundings. The inhabitants are well known for their industries, especially for their colored woven goods. Eastwards are the little towns of Tashkeupri and Boyabad; all are connected by passable roads.

South, in the territory of Devrez Chai, is the town of Koch Hissar in a productive basin, an eastward continuation of the Cherkesh basin. It is a local market on the chief transverse route of northern Anatolia, and as such it has better prospects than Tossia, off the route on the southern slopes of the Ilkaz Dagh where is an extensive grape cultivation.

The Interior of the Upland

Only two types of the interior country will here be described. They represent the chief types and present marked contrasts.

The Andesitic Upland

The western part of the interior of our region (Fig. 1) consists predominantly of young igneous rocks, the product of extensive outpourings of lava probably from fissure eruptions. The entire district has been peneplaned: only the resistant nuclear rocks rise above the general level. The dark color of the rocks, the soft rounded forms, bare surfaces with only a small, scrubby, xerophilous vegetation combine to create a dull and monotonous landscape. On the higher elevations small woods of black pine may be found, and at rare intervals oaks and wild pear trees. The valleys have a richer vegetation, willows and poplars and a modest cultivation of grain. Stock raising, especially of the Angora goat, is by far the most important form of economy. In the higher parts that surmount the peneplain, as in the Ala Dagh, are extensive pastures.

The hot springs of Kizil Haman, only 100 kilometers distant from Angora, should have a future importance.

Generally the settlements are found in the valleys, and the distinctive house type is a boxlike structure of rough stone mortared with clay; but frame houses stopped with clay, a transition type to the wooden house of the Pontic region, are not uncommon. An example appears in Figure 16.

The Miocene Upland of Changri

To the east an entirely different landscape prevails: clear bright colors, practically level plateau surfaces, and above them table mountains. Thick gypsiferous Miocene beds rest unconformably on metamorphic Paleozoics and the serpentine-schist-flint formation. The upland here is not a peneplain but is formed upon a thick basin filling that is now in process of erosion by the Kizil Irmak system. In the broad, shallow valley of the upland are found the chief settlements; the narrow valley of the Kizil Irmak on the contrary is avoided, probably because of its summer heat. This valley appears as an oasis with vineyards and fruit trees in the midst of steppes and semi-desert. In many places, however, they are left uncultivated because of the diminution in population.

Forests are entirely lacking on the upland; only bushes and xerophytic, cushion-like plants are to be found. The chief fuel is excrementa of cattle mixed with clay and straw and dried in the sun. The houses are rough box-shaped huts of clay, which on account of the extreme climate are built half underground: they are to be detected only by the tops of the stone walls and chimneys rising above the ground. Their occupants lead simple lives. Thin, flat cakes of bread baked on hot stones and *bulgur*, bruised wheat, form their chief aliment, to which is added in some areas *pekmez*, a sirup made from the dried grape. Equally simple are their tools and utensils, generally made of wood, and their oxcarts. Raising of the Angora goat here also is the chief occupation.

The projected line to Eregli will put Changri, the capital of the vilayet, in rail communication. Already the railway is within a few kilometers of Kalejik. Changri, in a deep valley, hot and dry, has an artisan population—weavers, carpet makers—and carries on a brisk trade in salt with the whole of northern Anatolia, the salt coming from a near-by mine in the gypsiferous deposits. The Tatly Su permits irrigation; and this, in combination with the warmth of the summer, makes for an exceptionally rich horticulture, the more striking in contrast with the arid and sterile highlands about. Next to Kastamuni, Changri is the most important town on the only north-to-south road in northern Anatolia—from Angora to the Black Sea.

SOME RURAL SETTLEMENT FORMS IN JAPAN

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JAPAN is an unusually fertile field for the study of rural settlement. The wide regional differences brought about by nature have been accentuated through the centuries by sectional and general isolation. Then, too, Japan has drawn its civilization from many sources. At least three independent culture centers can be identified: Satsuma, by way of which Loo Chooan, South Chinese, and, possibly, Oceanian influences have entered; Yamato, where Central and North Chinese, Korean, and probably Indian elements fused with the indigenous culture and gave rise to Japanese civilization; and Izumo, which by its situation and by ocean currents has always been closely allied to Korea. The effect of the Ainu upon the Japanese has also been great. It is generally recognized that the Ainu forms an important element in the racial make-up of the Japanese. The cultures of the two peoples are so thoroughly mixed that it is difficult if not impossible to separate all of the elements. Finally, Hokkaido, which was settled by Japanese agriculturists after the Restoration, bears strong evidence of American and North European influences.

FIG. 1—Map of Japan showing the location of the settlement forms discussed.

As a result, although Japanese culture is homogeneous in its broader aspects it differs areally in detail. It is here proposed to discuss certain settlement forms characteristic of considerable sections of Japan, though they do not of course exhaust all of the types found in the country. The areas to be considered are: the Yamato Basin, Satsuma, the Echigo Plain, and the Tokachi Plain. These geographical place names are used to indicate the different types of settlement forms presented: they are shown in Figure 1. Consideration will be given to the general pattern of distribution; the morphology of the agglomerations, or pattern of local dissemination; and the morphology of the occupance unit.

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The Yamato Basin

The Yamato type includes a group of exotic culture forms that were introduced from China prior to or during the seventh century of our era. It is dominant in the Yamato Basin and adjacent areas of low relief in the Kinki district, including parts of the Kyoto, Biwa, and Osaka plains and limited areas about Kobe.

The Yamato Basin may aptly be called the "cradle of Japanese civilization." Here, according to the Kojiki, the first emperor of the Japanese led his people from Kyushu in the seventh century before the Christian era.[1] Here Buddhism was first introduced and was soon followed by other elements of Chinese culture. On the level floor of this graben, soil, climate, and drainage conditions favored an intensive use of the land, and at an early date a dense population was found.

System of Land Division

Among the material cultural forms that reached Yamato from the Celestial Empire was a system of land division known as the *Han den*, or Chinese land system.[2] This involved a partition and repartition of the land into squares. The smallest and basic unit of division was a plat measuring about six by six feet. This unit was presumed to produce enough rice to feed one adult male for one day, and the plan was called the *ku bun den*, "mouth share land," system. Three hundred and sixty such plats formed the next largest square, enough on the basis of the lunar calendar to maintain one man for one year. All dividing lines were oriented north-south and east-west. The main roads left the four great gates of the Heijo (Nara) capital, and the entire settlement pattern was adjusted to them and to the system of land division. The original plan can be reconstructed by referring to ancient temple maps, the ruins of the Heijo capital, geographical place names, unusual surface and drainage forms, and certain historical documents. It will be found that elements of the landscape that antedate the introduction of the Han den do not fit the pattern. Such are the older imperial tombs and some ancient villages. Also, features which have been developed since the breakdown of the system do not conform. This is particularly true of recent village growth. The Han den is not a mere adoption of the ancient *Sei den* of China, or "well and field" system. It was altered

[1] Practically all authorities now agree that the actual date of migration from Kyushu was about the year 1 A.D., while the official chronology insists upon 660 B.C. as the date.

[2] Authorities differ as to the exact date of the introduction of the Han den. According to H. Weipert (Japonisches Familien und Erbrecht, *Mitt. Deutschen Gesell. für Natur- und Völkerkunde Ostasiens in Tokio*, Vol. 5, 1889–1892, pp. 84–140; reference on p. 124), the system was introduced from China under Kotoku Tenno, 645–655 A.D. The system was minutely described in the Taihô Riô, or Code of Taihô, in 702 A.D. An able discussion and partial translation of this code is to be found in C. J. Tarring: Land Provisions of the Taihô Riô, *Trans. Asiatic Soc. of Japan*, Vol. 8, 1880, pp. 145–155.

FIG. 2

FIG. 3

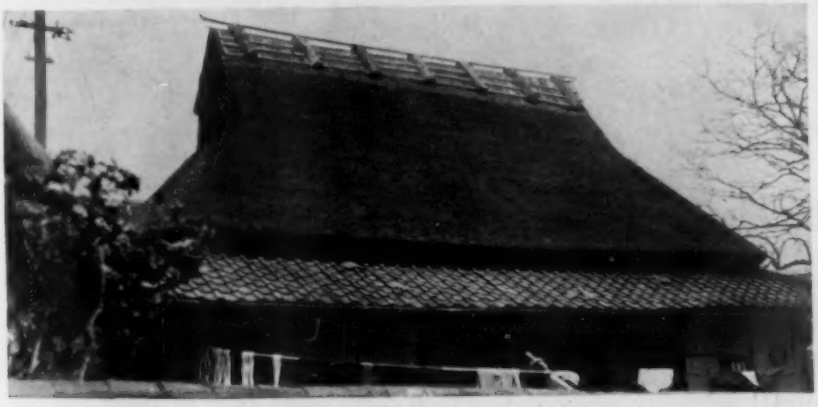

FIG. 4

FIG. 2—The moat about the northern kaito of Ō Mura.

FIG. 3—The rural population of the Yamato Basin is found in small, compact agglomerations, called kaitos, which are nearly uniform in size, form, and distribution.

FIG. 4—A Yamato house. Compare Figures 7 and 8.

and adapted to Japanese conditions and probably never was applied in full detail.[3]

Furthermore, the same unit of measurement was not used throughout Japan. During the Asuka period, the Han den was applied to the Osaka Plain and possibly about the Asuka capital in the southeastern corner of the Yamato Basin. At that time the square cho measured forty ken; and on the Osaka Plain double this unit, or eighty ken, was used.[4] However, after the Heijo capital was established and the Han den was prescribed for all of the Yamato Basin, the new square cho, or sixty-ken, unit was introduced. The later division of the paddy lands of Kinki seem to have all been on the sixty-ken measure. In dry lands a double unit, or 120 ken, was apparently used.[5]

The smallest politicial division is the *mura*, which in turn is divided into economic entities called *azas*. For example, muras that lie on the border of the plain may contain an *aza* of dry crop upland. There may also be an aza containing only *eta* peoples, who in addition to farming prepare leather, glue, and other animal products. Villages of these outcast people are found at the foot of most of the imperial tombs. As the land of the Yamato Basin is quite uniform throughout, it frequently happens that all of the land of the mura is suitable for rice cultivation. In such cases, the detailed operation and maintenance of facilities for irrigation and flood control are the responsibilities of the aza. The normal aza contains one agglomeration of houses. As the size and productive quality of the aza domain is much the same everywhere on the basin floor, these agglomerations tend to be uniform in size and distribution (Fig. 3). They also tend to conform to the pattern of the ancient Han den system (Fig. 5). About two hundred and fifty village agglomerations are found on the Yamato Basin floor, varying in size from a minimum of twenty houses

[3] Tokuzo Fukuda: Die gesellschaftliche und wirtschaftliche Entwickelung in Japan, Stuttgart, 1900, p. 43. Fukuda points out a number of differences between the Japanese adoption and the original Chinese system. G. Uchida: The Han den System of Medieval Japan, Nihon Keizai-shi no Kenkyu, Tokyo, 1921, Vol. 1, pp. 107–276, and S. Sekino: Some Considerations of the Heijo Capital and Its Palace, Tokyo, 1904 [both in Japanese], constitute the best of the numerous studies of the Han den system in Japan. Mr. C. W. Bishop points out that modern Chinese scholars are inclined to deny that this Utopian scheme was actually put into effect in China. Certainly it cannot have been completely applied in either China or Japan.

[4] The Asuka Period was contemporaneous with the Tang Dynasty of China. At this time the Chinese unit seems to have differed from the one used later. The writer visited the ancient site of the Korean capital, Keishu, and from the plan of the inner wall and the remains of the north-south and east-west roads the forty-ken measure was doubtless used. This capital was contemporaneous with the Asuka and the Tang. The imperial tombs and other cultural features of that time bear startling resemblance.

[5] One square cho is equal to 2.45 acres. Ten tan constitute one square cho. There were 360 tsubo, or plats of about six by six feet, in each tan during the Heijo period. Since then, 300 tsubo have officially become one tan. See N. Yamasaki and B. Sato: Regional Geography of Japan, Tokyo, 1913, Vol. 9, p. 581 [in Japanese]. It is interesting to note that throughout older Japan the average holding is about 2.45 acres, and the average size of the individual paddy is about .245 acres, or one tan. The ken is a linear measure and at present is 5.965 feet. There are six shaku in one ken. At the time of the Heijo capital two shakus were in use, the greater shaku being 1.176, the present and lesser shaku 0.98. See S. Sekino, *op. cit.*, p. 26.

to a maximum of eighty, with the majority having about sixty. These lie at an average distance of one kilometer from each other.

The Compact Village: Kaito

The typical village is also an exotic form and was introduced from China. It is an exceedingly compact agglomeration of rectangular

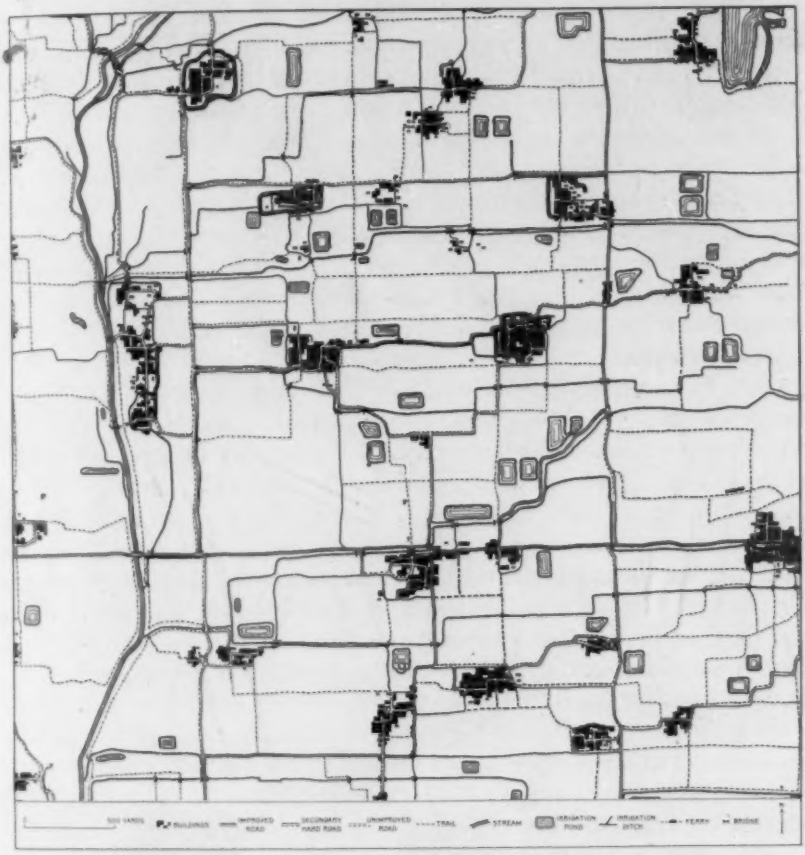

Fig. 5—Map of an area including Heiwa Mura and vicinity, Yamato Basin, Nara Prefecture. Note the rectangularity of all forms of the landscape. The impress of the ancient Han den is everywhere evident on the basin floor. Note also the dekaitos or detached houses and small agglomerations beyond the moat. Scale 1:35,000.

form surrounded by a hedge and a moat, so compact indeed as to appear a detached bit of urban landscape. These agglomerations may be described as of a checker-board pattern and are called locally *kaitos*, as such villages are in the old Middle Kingdom. The term *kaito* has been translated as "inside the wall." The writer found two villages in Yamato where remnants of ancient walls are to be seen and documentary evidence in three others that such walls once

existed. Another feature corresponding to the Chinese village is the four passages from the villages corresponding to the cardinal points of the compass. These are still referred to as the north, south, east, and west gates in spite of the fact that there have been no gates within the recollection of any living person. Two hundred and twenty-five kaitos can be identified within the Yamato Basin, or 90 per cent of all village agglomerations, lying below the 100-meter contour.

The moat, which may have followed Buddhism in its long journey from India, has lost its primary function, which was one of protection (Fig. 2).[6] Improved transportation and marketing facilities have lessened the need for the home cultivation of fish and so have decreased the value of the moat. The application in recent years of larger-scale and improved irrigation minimizes the dependence of the village upon a hand distribution of water from the moat during the dry season. Better flood protection, too, has been established, and hence the moats are not so necessary as drainage depressions. The breakdown of the village as a self-sufficient social and economic entity has done away with the desire for isolation. The advent of a money economy, replacing a purely land and rice economy, and the growth of larger-scale industrial and marketing establishments have destroyed many of the village industries and have forced contacts with the outside. The arbitrary establishment of political units, often enclosing several kaitos under one mura office, has helped to break down the village personality. The abolition of laws prohibiting individuals from moving away from their villages has had the same effect. New ideas have come with western science. A few years ago a young man was compelled to marry a girl of his own kaito. Now, the modern parent looks beyond the moat for a daughter-in-law, as he believes inbreeding to be undesirable. In every respect, then, the need for the moat has disappeared. On the other hand, the constantly increasing demand for more rice land takes a toll upon the ancient moat. In many cases the moats have completely disappeared and can be traced only in narrow, depressed paddies. Often, only the section on one side of a village has been reclaimed. In others the width has been reduced to a mere fraction of its former size.

The moat limits the number of houses which may be built within it. In Japan the eldest son inherits the property of the family, and the younger sons wishing to build their own home are soon forced to settle outside. This has been accomplished in two ways: first, by the development of new kaitos adjoining; secondly, by the formation of a *de* kaito (outside of "inside the wall") just beyond the moat and along one of the roads leading from the village. De kaitos are found

[6] Professor Hamada believes that the moat had a natural and independent development in Japan. Other authorities believe that it was borrowed from China. The village moat is confined to Yamato and adjacent areas in the Kinki district and seems to have developed simultaneously with the introduction of Buddhism.

on upland areas where cotton was grown a century ago and where now mulberry is the chief crop. Other de kaitos are of recent origin and have grown up where the road from the village crosses a railroad or interurban line. The secondary agglomerations can be traced to

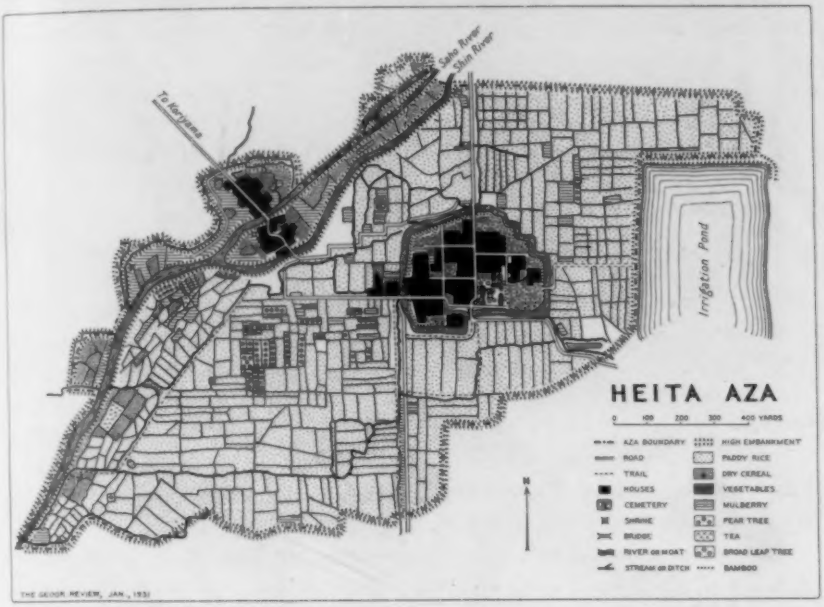

FIG. 6—Map of Heita Aza, Nara Prefecture (Yamato Basin). Scale 1:20,000.

their place of origin by family names, shrines, and the detail of agricultural methods and house structure.

Another feature of settlement which can sometimes be recognized is the rough arrangement of houses into groups of five, six, ten, or twelve. This system is called the *kumi* or *goningumi* (company of five)[7] and in China and Korea was a military expedient.[8] In Japan it seems to have been purely for social control. The kumi had a contemporary introduction with the Han den and kaito and so became established in the Kinki district but apparently did not develop in central or northern Japan. Such an arrangement of houses into company groups is not an obvious feature and usually can only be recognized after attention has been called to it.

ECONOMY OF THE KAITO

The compact village form (*haufendorf*) of the kaito is well adapted to the mode of life of a paddy area. Rice culture demands coöperation

[7] Matsuyo Takizawa: The Penetration of Money Economy in Japan (Columbia Univ. Studies in Hist., Econ., and Public Law, No. 285), New York, 1927, p. 23.

[8] D. B. Simmons and J. H. Wigmore: Notes on Land Tenure and Local Institutions in Old Japan, *Trans. Asiatic Soc. of Japan*, Vol. 19, 1891, pp. 37–270; reference on p. 95.

along several lines. Irrigation is essential, and the irrigation of the Yamato Basin is operated in detail by aza units, or in other words by the unit of land worked by the people of one or two kaitos. Similarly, flood protection is largely an aza enterprise. Soil fertility is maintained only by the application of large quantities of night soil. Ordinarily the workers of the fields do not supply enough to maintain the best production, and additional quantities must be purchased from near-by towns or cities. This, too, tends to become a coöperative activity of the kaito. Wells, streets, storage buildings, and social facilities are subject to community use. Furthermore, the value of paddy land is such that any saving of area through community use is highly desirable.

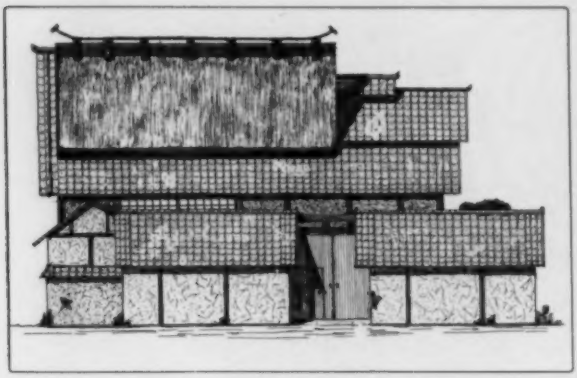

FIG. 7—A Yamato house.

The very pronounced seasonal demand for labor in the rice field allows a great deal of unoccupied time. Even in the Yamato Basin, where a fall-sown dry crop is part of the general system, the average number of days per year on which the farmer is employed in agricultural pursuits is 120. Under such conditions, home and small factory industries "inevitably develop."[9] Such industries can be conveniently manned in a compact settlement. Although dominantly an agricultural community and at first glance entirely one, the kaito contains within it a considerable amount of industrial activity.

The area of paddy land that can be farmed by one family is everywhere small. In the Yamato Basin the average family works 6.9 tan, or 1.69 acres. The entire area of rice land, then, worked by a village of sixty houses, is about 100 acres. To this can be added about 30 acres for roads, embankments, ditches, cemeteries, shrines, dry fields, etc. The centrally located kaito, then, can be reached from any part of the area in a few minutes. This is important in transporting fertilizer and other supplies.

Another aspect of the kaito is that it forms virtually a single family unit[10] maintaining a common shrine and burial ground. Commonly

[9] H. Sasaki: The Mechanisms of the Formation of Settlements in Basins, *Geogr. Rev. of Japan*, Vol. 2, 1926, No. 9 [in Japanese].

[10] According to Mr. C. W. Bishop the present organization may be a broken down derivative from an original endogamous unit consisting of normally two families (or clans) which were themselves exogamous.

but one or two family names are to be found within the moat, and rarely are there more than four or five. These families are usually related to one another by marriage. This feature is most desirable in the eyes of the home-loving Japanese. There is some historical evidence and an abundance of tradition pointing to the existence of compact settlements before the introduction of the Han den. This is not surprising, for rice culture had probably already existed in the Yamato Basin for at least a century.[11]

The Yamato House Type

The dominant occupance unit of Yamato is oblong in shape, enclosing within one wall the house, sheds, drying yard, and gardens (Figs. 7 and 8). Although there is some variation from village to village, the general structure and ground plan run to type and differ from the occupance units of Japan outside of the lowlands of the Kinki district. The gate, the wings of outbuildings, and other features are reminiscent of Chinese structures. Because of the compactness of the agglomerations and the relative deficiency of rainfall in the Yamato Basin the fire hazard is great. Tile roofs and awnings, thick plaster over wattle, and other noncombustible materials are widely used. Frequently one sees the old thatch covered by tin, which is painted black but in detail conforms to and maintains the graceful line of the ancient roof.

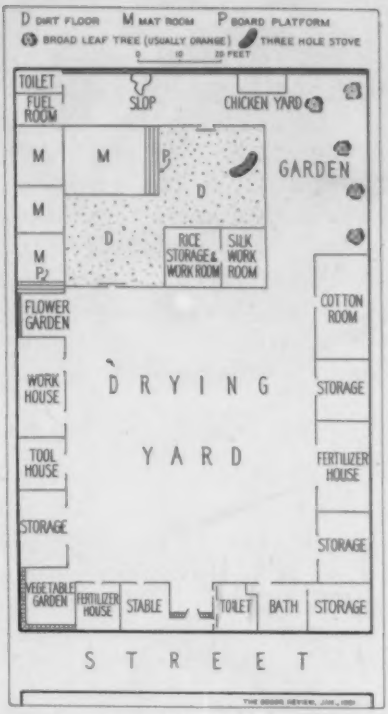

FIG. 8—Ground plan of a Yamato occupance unit. Note the many auxiliary buildings.

Count was made by the writer in twelve representative Yamato villages. More than 70 per cent of all dwellings were enclosed by walls and sheds, or the remains of a former enclosure could be found in different stages of decay. The typical house has its longest axis parallel to the street and at right angles to the long axis of the enclosure. Three to five rooms constitute the average house. The floors of all rooms except the kitchen are elevated and covered with *tatami*,

[11] According to tradition and some historical evidence, the Prince Shotoku, who was a zealous advocate of Buddhism and Chinese culture, was responsible for the extension of irrigation and rice culture during the sixth century of the Christian era throughout the Yamato Basin. Before that time, it is said, the people lived on burdock.

or reed mats, of standard size. The heating unit of Yamato is the single and movable *hibachi*, or artistic charcoal brazier.

The highly developed kaito affords a maximum of seclusion. From outside the moat one can see only the continuous blank walls of *kuras*, sheds, and walls peering through the irregular bamboo-and-pine hedge. Within, one sees only continuous lines of walls and closed gates on either side of the narrow street. One receives a peculiar impression of deadness in such settlements, broken only by the voices which can be heard beyond the walls or by a fleeting glance of some individual disappearing through a neighbor's gate.

The distribution of the three forms or degrees of settlement is not identical. The Han den was established in parts of northern Shikoku Island, but the kaito and the Yamato house are entirely lacking. Kaitos are reported near Nagoya; but a different house type prevails, and there is no indication of the Han den system to be found. Both kaitos and the Yamato house are found on the Osaka and Kyoto plains, yet they are not dominant, while the Han den has left a most firm impress. However, all three elements combine to place a characteristic stamp upon the settlement landscape of the Yamato Basin.

The Satsuma Type

The Satsuma type embraces a number of relict culture forms dating from or in some cases antedating feudal days. The essential characteristics of this type dominate the settlement of Satsuma, Osumi, and adjacent areas in Hyuga.

The southern portion of Kyushu is an ash plateau through which protrude, in places, granite mountains and andesitic cones. Deep gorge-like valleys cut into the plateau, and small alluvial plains border the sea. The climate is subtropical, and the area lies near the center of the great typhoon path. Bamboo is abundant and often reaches seven inches in diameter. Evergreen broadleaf trees grow to great size. A soft, friable, ash-colored rock occurs near the surface in many places. It can be easily quarried and cut.[12] The Kumakii mountain land crosses Kyushu from east to west and effectively separates Satsuma from the rest of Japan.[13] To the south, however, easy communication is maintained with the Loo Choo Islands. These conditions have fostered political independence and southern cultural affiliations.

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[12] This rock—called locally Hai-ishi, or ash stone—is a hypersthene-trachyandesite. Ease of working rather than intrinsic value is the reason for its extensive use. Bundjirô Kotô: The Great Eruption of Sakura-jima in 1914, *Journ. College of Sci., Tokyo Imp. Univ.*, Vol. 38, 1916, Article 3, p. 13. The universal use of high and massive walls in the towns and Fumotos is made possible by this rock. Its use as crest mounts, for making bath tubs, and for a variety of other purposes lends a unique aspect to Satsuma town houses.

[13] The Kumakii mountain land is but part of that mighty mountain mass which marks the major dislocation line of Japan. It separates the inner geological zone from the older, outer zone and extends through central Kyushu, Shikoku, the Kii Peninsula, and penetrates Honshu as the Akaishi Mountains.

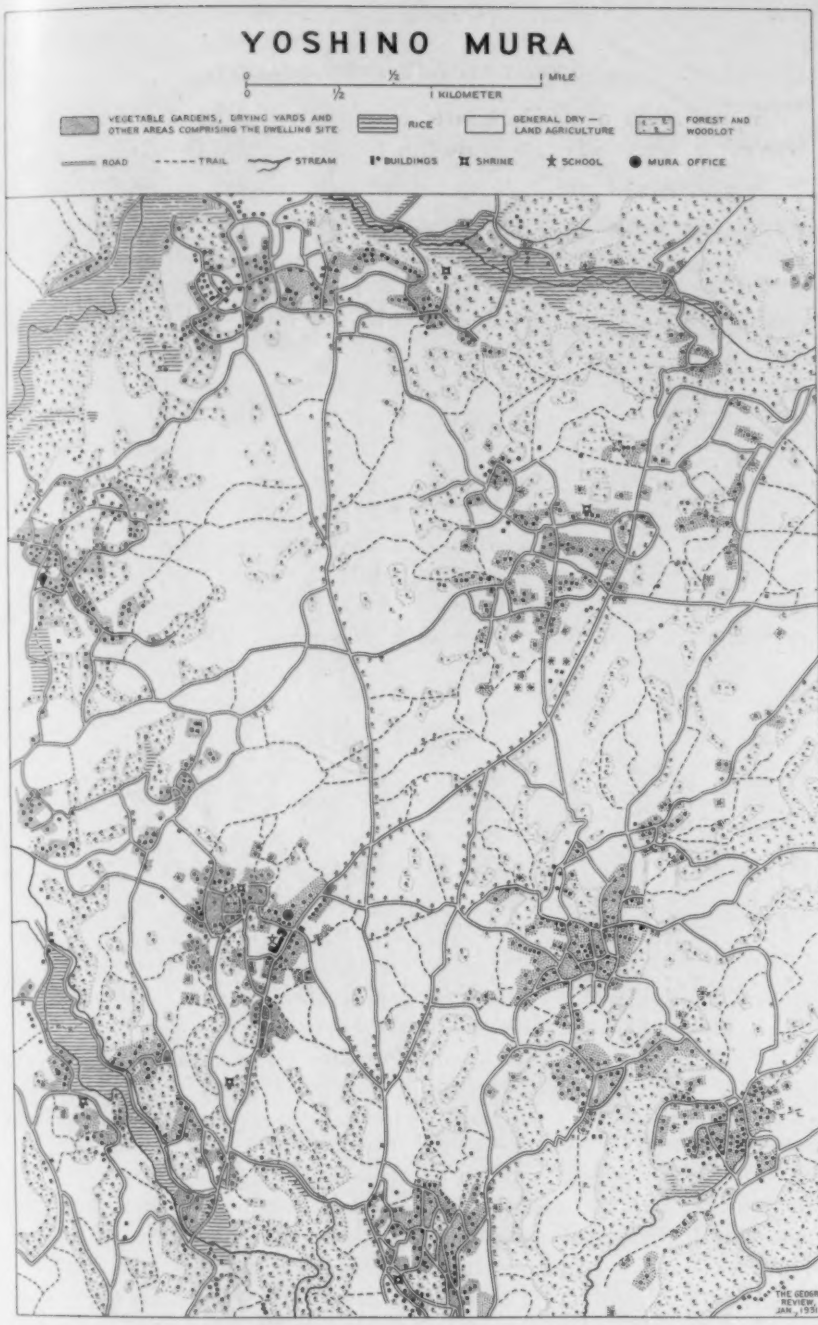

FIG. 9—Map of Yoshino Mura, Kagoshima Prefecture (Satsuma). Scale 1:40,000.

Isolation and Individuality

Southern Kyushu is at least a quarter of a century behind the rest of Japan. Satsuma is at the same time the most difficult and most profitable place to study ancient Japan, at least in one phase,

Fig. 10—Map of an area about Izumi, Kagoshima Prefecture. Note the ancient castle site (enclosed in a circle). The government offices (shown by an oval) occupy part of the old fumoto, or walled village. Samurai families still reside to the immediate north and east of the government offices. The machi, commercial settlement, the elongated area of compact buildings west of the government offices, occupies a characteristic position in regards to the fumoto. For legend see Figure 5. Scale 1:35,000.

for its individuality has always been well marked. Satsuma remained as a semi-independent state even to the extent of making individual treaties with foreign nations and to waging war on the Imperial troops after the Restoration. Even today the standard dialect of Japan is called *yoso-no-kotoba*, or the outside language; and the Satsuma dialect, which is unintelligible to other Japanese, is spoken in the home. Temples to the rice goddess, which are found in all other provinces, do not occur; and instead the paddy fields are graced by a small local rice god. Several important industries are common to

and apparently had their origin in the Loo Choo Islands. The sweet potato, which serves as the chief food of the masses of southern Kyushu, is called the Satsuma *imo*, or potato, in Tokyo. In Satsuma it is called the Loo Choo *imo*. In Loo Choo it is called the *kara*, or

FIG. 11

FIG. 12

FIG. 11—The walls of the fumoto at Izumi, Satsuma.
FIG. 12—A sub-level road in the ash plateau of Satsuma. Near Yoshino.

Chinese potato;[14] and in south China it is referred to as the foreign potato. There are historical data also to prove the introduction of the sweet potato by this path. The exterior appearance of the Satsuma rural house is more like the houses of the northern Loo Choos than like other parts of Japan.

CASTLES AND WALLED VILLAGES

In the early feudal days each lord maintained a castle and ruled his domain with little interference from the outside. Satsuma is still

[14] B. H. Chamberlain: The Luchu Islands and Their Inhabitants, *Geogr. Journ.*, Vol. 5, 1895, pp. 289–319, 446–462, 534–545; reference on p. 301. See also Edmund Simon: The Introduction of the Sweet Potato into the Far East, *Trans. Asiatic Soc. of Japan*, Vol. 42, 1914, Part II, pp. 711–724; reference on p. 712.

known in legend and ballad as "the land of a hundred-and-twenty castles." After the rise of the Shimazu family and a conquest of Satsuma by the forces of the Shogunate, these castles were destroyed and the power of the Shimazu became complete. Upon the ancient sites were constructed walled villages, *fumotos*, which were occupied by a new people especially set into the social system for the purpose

FIG. 13—Satsuma occupance unit in the ash plateau country.

(Fig. 11). These were the *Go-samurai*, or farmer-warriors, who owed allegiance directly to the house of Shimazu and were controlled by it in the same fashion as other parts of Japan were ruled by the Shogun.[15]

The castle had doubtless drawn the country folk to it, and the new fumoto tended to have the same attraction. As a result, we find the present huts built in a series of roughly concentric circles about the fumoto site, which, as the name implies, lies at the foot of the mountains.[16] It is interesting to note that the number of fumotos so far identified, 102, corresponds closely with the present number of muras, 140. Another element, too, is found. This is the so-called *machi*, or commercial agglomeration. Normally it approximates a *strassendorf* at some central location near to and on the main road from the fumoto. Today but few fumotos maintain their original structure. In most cases the sites are now used for schools, village offices, military barracks, and other public buildings; but the name and the great walls still persist, as does the center of local government. It is interesting to note that the mura boundaries have undergone but little change through the centuries. They are essentially the same as they were in the thirteenth century when the Shimazu family arrived from Kamakura. This is well shown on the interesting and

[15] An expression still used by the Samurai class of Satsuma is, "A man's castle is his home, and every home is a castle."

[16] The word *fumoto* has been variously translated as "the foot of the mountain," "center of the village," and "support to the power." Obviously, all apply, but the former seems most justified.

valuable map collection of the Shimazu Museum in Kagoshima. It is highly possible that the lines represent much earlier tribal divisions.

The Satsuma House

The house of the fumoto, where it is still found, partakes of urban diversity and characteristics. It is the home of a well-to-do and socially exalted family. Nor are there any distinctive features to the buildings of the machi. The Satsuma samurai, however, carried the segregation of sexes to a degree not reached elsewhere in Japan; and the ground plan, as many houses indicate, shows separate quarters for the men and the women. The Satsuma rural house, on the other hand, is a true product of its environment. It is little more than a tropical hut of rough board and thatch and bears considerable resemblance to the houses of Loo Choo and lands equatorward (Figs. 13 and 14). The house, except for the kitchen portion, is raised on stilts about two-and-a-half feet above the ground and is open on one or more sides the year around. This affords adequate aeration in the warm, moist climate of southern Kyushu. Little if any provision is made for heating the house, and usually only an *irori* or small imbedded *hibachi* is found, which is used simply for making tea. Rooms with board floors are of common occurrence, and many houses have but one room with *tatami*. The *shoji*, or paper doors, are frequently displaced by heavy modern doors similar to those of Loo Choo. The fine wood carving found in the better rural houses of other parts of Japan is absent in Satsuma. Such work is done in cedar (*Cryptomeria japonica*). This tree is not found in southern Kyushu, and around the shrines and temples camphor and other great broadleaf evergreens replace the stately Japanese cedar to the north.

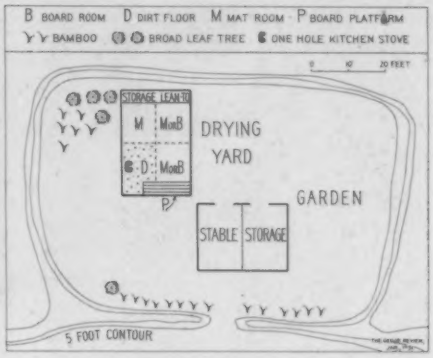

Fig. 14—Ground plan of a Satsuma occupance unit.

By count in portions of twelve muras, the great majority of the country houses bear crude, roughly trimmed thatch roofs; about a tenth of them have shingle roofs, and of these about a half are capped on the crest by cut stone slabs. In the *machis* and larger agglomerations there are many tile roofs. The roof is steep-pitched and relatively high. The eaves line extends to six feet above the ground on the front of the house, while the crest line is sixteen to eighteen feet high. This allows a rapid run-off during the heavy

fall rains and furnishes considerable attic space for curing tobacco, which is the chief money crop of the region. Frequently the thatch extends to the ground at the rear and south side of the house. This is for typhoon protection. The space thus afforded is occupied by

FIG. 15

FIG. 16

FIG. 15—A Satsuma house. Compare Figures 13 and 14.
FIG. 16—Satsuma presents a picture of tropical verdure. The distribution of the rural population is disseminated with a tendency toward agglomeration. Near Ijuin, Kagoshima Prefecture.

stout bamboo poles, which are used to prop up the buildings and fruit trees during violent winds. One or more small storage sheds, of much the same size and roof structure as the house, stand near but detached from the dwelling unit.

Buildings, bamboo hedges, and trees are so arranged as to furnish a maximum of shade during the hot summer months and typhoon protection during August, September, and October. Wherever possible, buildings and vegetable gardens occupy platforms excavated in the soft ash material which maintains itself in vertical cliffs. The desirability of having these cliffs on the south side, for shade and wind protection, accounts for the overwhelming number of houses found on the south side of valleys. The different dwelling units are separated from each other by garden and waste land but are connected with each other by trails, which through centuries of use have sunk deeply below the general level. Overhanging the trails and house sites a luxuriant growth of bamboo is found, above which tower, here and

there, giant camphor trees. This sublevel arrangement affords excellent protection from the devastation of typhoons (Fig. 12). The people of southern Kyushu guard against this phenomenon as do the people of the geologically younger parts of Japan against earthquakes.

FIG. 17

FIG. 18

FIG. 17—A section of the *strassendorf* near Teradomari, Niigata Prefecture.
FIG. 18—A serpentine shaped fishing village on Sado Island.

Six storms of unusual violence, causing untold damage and the loss of many lives, have occurred since 1892. On August 15, 1899, a wind velocity of 112 miles an hour was recorded at Kagoshima.[17]

Nor is Satsuma free from earthquakes. Such disturbances frequently occur, especially around the rift bay of Kagoshima, and the damage done is often great, for the ash cliffs tumble upon the houses and great land slides engulf dwellings and gardens.

Another natural calamity which must be guarded against and which influences the pattern of population is the floods that accompany the heavy fall rains. Rural houses are always found above the valley floor level, either up the valley side or on hillocks in the wider valleys. The domestic use of springs is necessary in the plateau country, for wells are out of the question where the porous ash material is thick. This is another pertinent reason for the location of the population on the lower valley slopes near the spring horizon.

[17] Kagoshima Meteorological Observatory: Storms of Oshima and the Meteorological Changes Involved, Kagoshima, 1926, pp. 9–10 [in Japanese].

The small, crude, nearly equilateral Satsuma house extends northward into the Kumakii mountain country. Southward it reaches to Oshima, modified by an elaborate development of lean-tos, an accretionary arrangement of buildings, and the use of coral rock for fences. In the Loo Choos the indirect entrance, to ward off evil spirits, tells of one Chinese custom that has apparently never penetrated Japan.

The disseminated pattern of rural population distribution found in Satsuma differs markedly from that of Yamato. The ash plateau and mountain lands of southern Kyushu do not allow any extensive rice culture. Sweet potato, millet, and barley are the important crops. Of the arable land 73 per cent is in dry crops, and the average family holding including the paddy lands is 10.3 tan. Larger areas are involved, agricultural land is not continuous, and there is much less need for coöperation.

The Echigo Type

The Echigo type involves a dry point settlement which is serpentine in form owing to location upon ancient dunes and active and abandoned levees, a particular distribution of landownership, and a house form well adapted to the local conditions. It is characteristic of the complex delta plains bordering the Sea of Japan, particularly the Echigo, Takata, and Shonai plains.

The Echigo Plain, which constituted the datum area for this study, is the largest delta plain in Japan. It is formed by the deposits of the longest of the Japanese rivers, the Shinano, and other streams. The chief utilization and settlement problem here is the superabundance of water. The shallow, meandering rivers that cross the flat, poorly drained plains are not able to handle the floods that accompany the thaw of late April and early May or occasionally occur with heavy August rains. The coasts of the Sea of Japan receive a heavy winter precipitation, and the heaviest snowfall of Japan occurs in this general area. Everywhere on the Echigo Plain the average annual snow accumulation is between one and two feet. On the adjacent Takata Plain it is three to four feet. The entire mountain area of the prefecture, constituting the chief drainage area, has an accumulation of over three feet, with considerable areas having eight feet and limited areas having slightly more than ten feet.[18] Maximum accumulations of as much as twenty-three and a half feet were recorded in the winter of 1926–1927.[19]

Seven parallel dune ridges are found on the Echigo Plain, lying approximately equidistant from one another and parallel to the coast. In addition, many levees marking present stream channels

[18] Niigata Meteorological Station: Snowfall in Niigata Prefecture, Niigata, 1923 [in Japanese].

[19] Central Meteorological Station: The Distribution and Causes of the Great Snows of the Winter of 1926–27, Tokyo, 1927 [in Japanese].

or abandoned meanders and ancient lake strand lines occur, which, in general, trend at an angle to the shore. These serpentine elevations afford flood protection for roads and settlements (Fig. 19). They also afford land for vegetables and other dry crops that cannot be

FIG. 19—Map of an area, including Sonogi Mura and vicinity, Echigo Plain, Niigata Prefecture. Note the road and settlement pattern marking the levees of an abandoned meander in the southwestern portion of the map. For legend see Figure 5. Scale 1:35,000.

grown on the rice land, for here the paddies are wet at all seasons. Bordering areas with rugged coasts afford elongated village sites between cliff and sea. These are settled chiefly by fisher folk.

Historically, this general area has been isolated from the central government in eastern Japan by the mountain masses intervening. The elaborate system of land laws which in other parts tended to discourage the growth of great landlords were not enforced here. Furthermore, the large scale and costly reclamation by drainage which was so often necessary could best be borne by wealthy individuals. It is said that here the farmer landlords controlled the military lords in the feudal days. Today, the largest and wealthiest land-

owners of Japan as well as the most serious agrarian problems are found in this area.

Shoestring Settlement Pattern

The general pattern of settlement, as we have noticed, is of shoestring form. The greatest development of *strassendorf* settlements

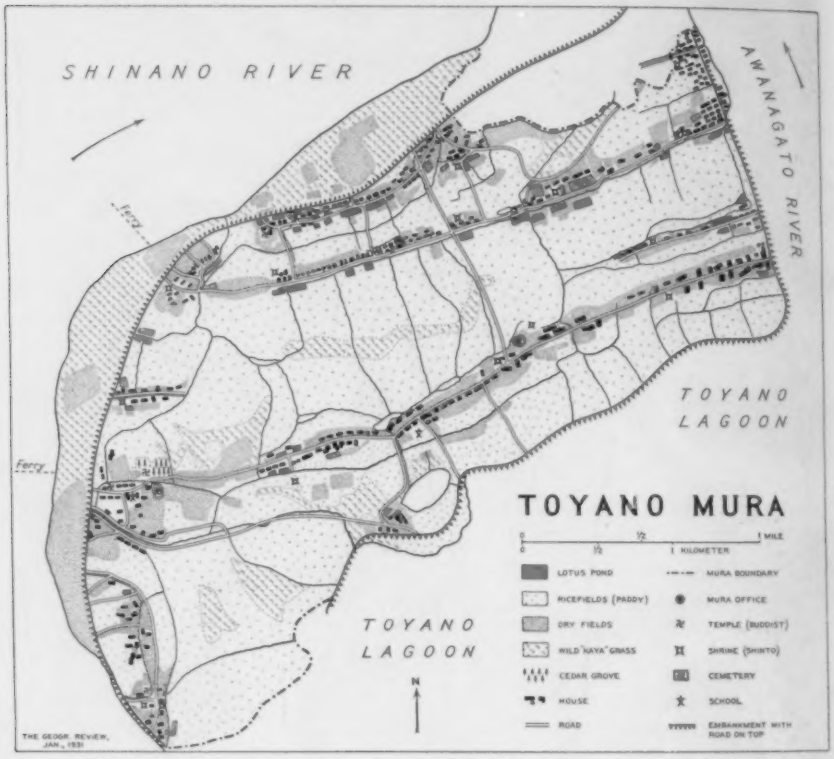

Fig. 20—Map of Toyano Mura, Echigo Plain. Scale 1:50,000.

in Japan occurs here (Fig. 17). Frequently, such settlements extend unbroken for more than a mile. Disregarding slight interruptions, a few exceed five miles. Over ninety per cent of all agglomerations on the Echigo Plain are either well developed *strassendorfs* or approximate that form. The overwhelming majority are on elevated sites as well. About 55 per cent of such sites are levee tops, 8 per cent are lagoon strand lines, and the remainder are on ancient dune ridges. In many cases such forms constitute the nucleus for present-day expanded towns and cities. The completion of the Ozu cut, a flood canal from the inner plain portion of the Shinano River to the sea, has reduced the flood hazard in certain areas, and a departure from the old settlement form may be expected in the future.

Typical Agglomeration Structure

Toyano mura furnishes a good example of typical agglomeration structure. On the north and west it is bounded by the Shinano River, on the south and east by the Toyano Lagoon and the Awanagato River. Two ancient dunes trend northeast-southwest and parallel each other. They are so located that they divide the mura into three rectangular areas of about equal size. The dunes lie deeply buried in alluvium, and their tops are but three to four feet above the plain level. Along the crest of each dune ridge a road extends, bordered on either side by lines of trees, houses, and dry gardens. The north dune ridge is narrow, and the road runs close to the southern border. The houses and most of the dry fields occur on the north side. A few vegetable gardens and lotus ponds extend southward where the sand is widest. The south dune ridge, on the other hand, is quite wide; and houses and gardens line the road on either side. About midway between the two are found remnants of another dune ridge, which is for the most part completely covered by alluvium. On the east and west margins these remnants are extensive enough to support a road, dry gardens, and settlements. Dry fields extend everywhere behind the houses to the end of the sandy levees of both rivers and, in places, afford similar utilization. The mura office, school, and other public buildings and the few shops are near the center of population. Practically all other land is the perpetually wet paddy fields.

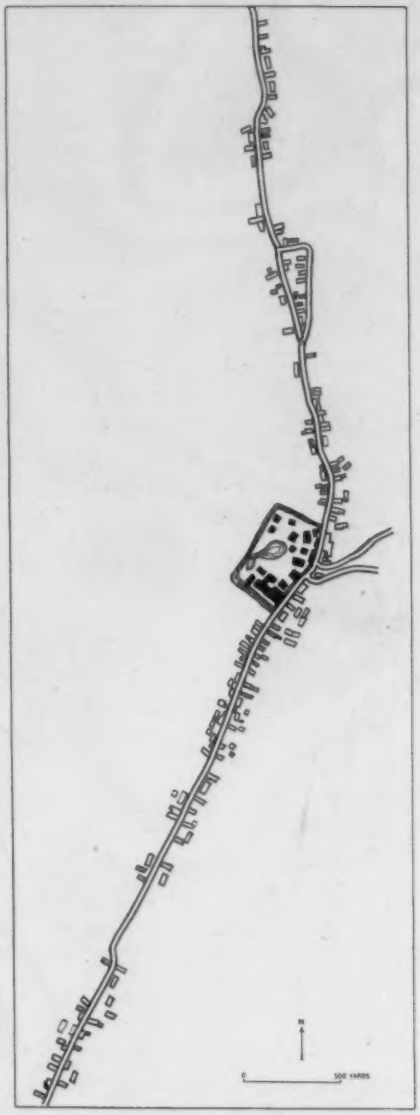

FIG. 21—A part of Nakaura Mura, Echigo Plain, Niigata Prefecture. Note the large walled estate of the local landlord (buildings in solid black) and the adjoining *strassendorf* of tenant houses (buildings in outline). Scale 1:35,000.

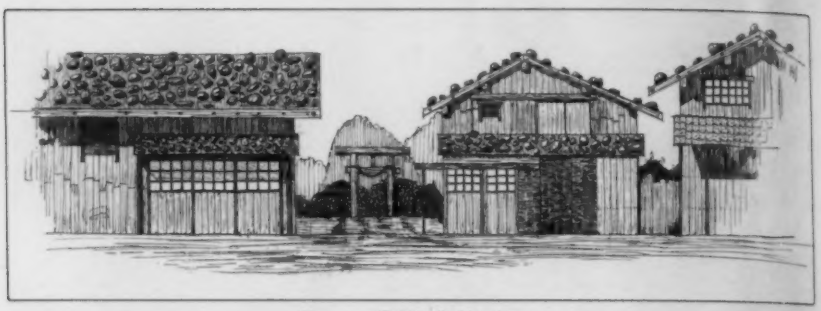

FIG. 22—Echigo habitations.

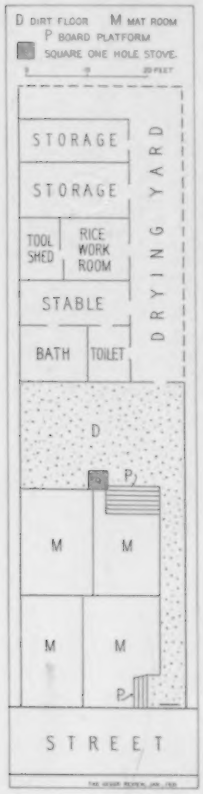

FIG. 23—Plan of Echigo occupance unit.

Canals flow parallel to the settlements at the foot of the dune ridges and levees. These are connected to other canals and to small basins. The whole pattern ties into the lagoon and the river, and water transportation is possible to Niigata City and other market towns. Nearly every house owns a flat-bottomed rowboat, and the mura owns several. These boats serve both for transport and for escape in times of flood.

In Taie aza the elevated land is quite wide; and, in addition to the central *strassendorf*, houses are found scattered to the edge of the rice land. Igarashishima aza lies in the active shore dune belt. Here roads and settlement occur between the dune ridges and the dune slopes, in some mysterious way made to produce barley, sweet potatoes, watermelons, and other dry crops. Proximity to the sea allows a considerable part of the income from fishing. The houses are widely separated, and the pattern differs from other parts of the plain. Taradomorie is a fishing village of 1000 houses that occupies a narrow terrace bordering the sea. For more than a mile houses line both sides of the road so close together that a path between them is rarely possible. The villages named exemplify certain variations on the typical pattern. In the extreme northern and higher portion of the Echigo Plain, called locally the Kambara Plain, destructive floods are unknown, and the rice lands dry out for part of the year. A good deal of dry crop land is found here, and sericulture is an important industry. Here dry point settlements are not essential, and dry agriculture encourages dissemination. As a result, the house of the local landlord is often surrounded by a halo of tenant huts, giving somewhat the same pattern of distribution, but on a smaller scale, as was found in Satsuma.

Some Large Estates

An analysis of the individual village shows a central focal point occupied by the great enclosed estate of the local landlord or by the public buildings of local administration (Fig. 21). Near by resides the commercial population. From this locus the peasant homes extend in either direction along the road. The largest landowners of Japan

Fig. 24—An Echigo rural house in the village agglomeration near Kameda station.

proper, as has been noted, are found on the delta plains of the western shores of Honshu. Most of these families date back about three centuries, i.e. from early Tokugawa times. The acquisition of land took place chiefly through money lending, although a considerable amount of reclamation must also be credited to these families. The greatest landowning family of all is found on the Shonai Plain. The second greatest arose in Suibara mura on the Echigo Plain. More than 4000 acres of land are owned by this family, of which 3500 acres are in crop; and the land is tenanted by 2486 families, or about 14,000 persons. The owner is an absentee landlord, residing in Tokyo; but the great estate house is still kept open. Before 1919 the tenant paid 60 per cent of all crops as rent; but by constant opposition, legal and otherwise, the tenants now pay but 40 per cent. The value of the estate has consequently decreased from 6,841,000 yen to 4,044,000 yen. At the same time the land tax has been considerably increased. The lot of the big landowner thus has its difficulties, yet there seems to be no increase in the number of small landowners.[20] The northern

[20] Data furnished by the Prefectural Office at Niigata. According to the census of 1928, there were 200,045 farm families in the prefecture. Of these, 67,361 were tenants, 86,940 tenanted land but also owned a little, and 45,744 owned all the land they worked. A large part of the last group, however, live in the mountain districts.

part of the Echigo Plain is almost completely occupied by tenant families, and the central and southern parts more than half so. Suibara village proved to have 83 per cent tenants and the remainder shopkeepers, artisans, and a few freeholders. Several adjacent settlements are under the control of the same family estate.

FIG. 25—An isolated rural house of the Echigo type on Sado Island.

The Sea of Japan periphery of Honshu has been one of the chief areas of emigration. Thousands of Echigo families have settled in Hokkaido. At present there is a rapidly increasing migration to Brazil. Another result of the existing lack of opportunity and uneven distribution of wealth is seasonal migration. In the summer, agriculture and fishing afford some occupation; but during the cold winters many laborers move to the industrial parts of Japan. The professional fishermen, in large numbers, ply the waters about Karafuto and Kamchatka in summer but return to Niigata harbor and the Shinano River in winter.

THE ECHIGO HOUSE

The Echigo house has definite characteristics but conforms, as elsewhere, to the Japanese domestic demands upon it. The severe winters necessitate a heavy board construction. The roofs are of crude but heavy wooden shingles held in place by stones. The roof is asymmetrical with the shortest slope on the leeward side or facing the street. This is to retard accumulation of snow and to minimize the danger of snow falling from the roof. In the older towns board awnings extend several feet into the street to allow free passage in times of heavy snow. The general structure is elongated, and the sheds and storage buildings are continuous with the living quarters

(Fig. 23). Where close settlement occurs, the longer axis usually lies at right angles to the street (Fig. 24); but where an individual house is found, the opposite orientation is often used (Fig. 25). Another adjustment to the limited ground space is the general constructon of story-and-a-half and two-story houses.

Over extensive areas the tall, straight water oak (*Quercus acuta*) borders every road and yard and grows upon the dikes separating the paddy fields. In the harvest season long poles join the tree trunks, and there the grain is hung to dry, masking the landscape in every direction. In other areas every yard and field contains piles of long poles protected with straw and leaves. These are set up and joined by horizontal poles during the harvest. By these devices the grain is kept safe and dry in case of flood. Often the trees or poles about the yard support squash and cucumber vines that shut off the house from view. Another feature—a consequence of the abundance of water—is a platform of earth in a corner of each paddy field. These platforms average about five feet by five and are elevated two and a half or three feet above the paddy. They serve to store poles and fertilizer and afford dry ground for the worker. Where the fields are wettest boats are used for harvesting, and the platforms serve to store the cut grain.

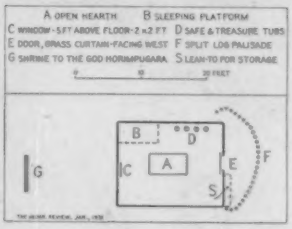
A OPEN HEARTH B SLEEPING PLATFORM
C WINDOW - 5 FT ABOVE FLOOR - 2 x 2 FT D SAFE & TREASURE TUBS
E DOOR, BRASS CURTAIN - FACING WEST F SPLIT LOG PALISADE
G SHRINE TO THE GOD HORIMPUGARA S LEAN-TO FOR STORAGE
0 10 20 FEET
B
D
G
C
A
E
F
S

FIG. 26—Ground plan of an Ainu occupance unit.

On the Takata Plain there is a very heavy snow accumulation. Trains run under snow sheds for miles at a stretch. The Takata house has an unusually long extension of roof running into the street. Often not more than three or four feet of space exists between the roofs of houses on opposite sides of the street. The center of the street is filled with snow in the winter, and often the houses are almost submerged. The inhabitants get about by means of tunnels dug in the snow and under the protecting roofs. Communication is maintained between houses by bamboo tubes—a centuries old telephone.

Each house or small group of houses has a well. In the dune ridge settlements water is reached at about four feet. It is dirty and is run through crude bark and charcoal filters before being used. Each agriculturist's house has a fertilizer tank, it being impossible to store fertilizer in a field tank as in drier fields.

The Echigo house is found in all parts of Sado Island. The development of *strassendorf* settlements is also most marked. These are chiefly shore villages, although dune ridge settlements are found on the alluvial central plain. The road skirting the east side of the island runs through several political divisions, but settlement is nearly continuous for about seven miles on it.

FIG. 27

FIG. 28

FIG. 29

FIG. 27—A new settlement between Obihiro and Biroo, Tokachi Plain.
FIG. 28—A characteristic farmstead on the Tokachi Plain about five miles south of Obihiro.
FIG. 29—An Ainu house, Tokachi Plain.

The Tokachi Type

The Tokachi type is of recent development and is adjusted to the extensive agricultural system and severe winters of the Hokkaido frontier. It is more or less characteristic of all settled areas of low relief in Hokkaido.

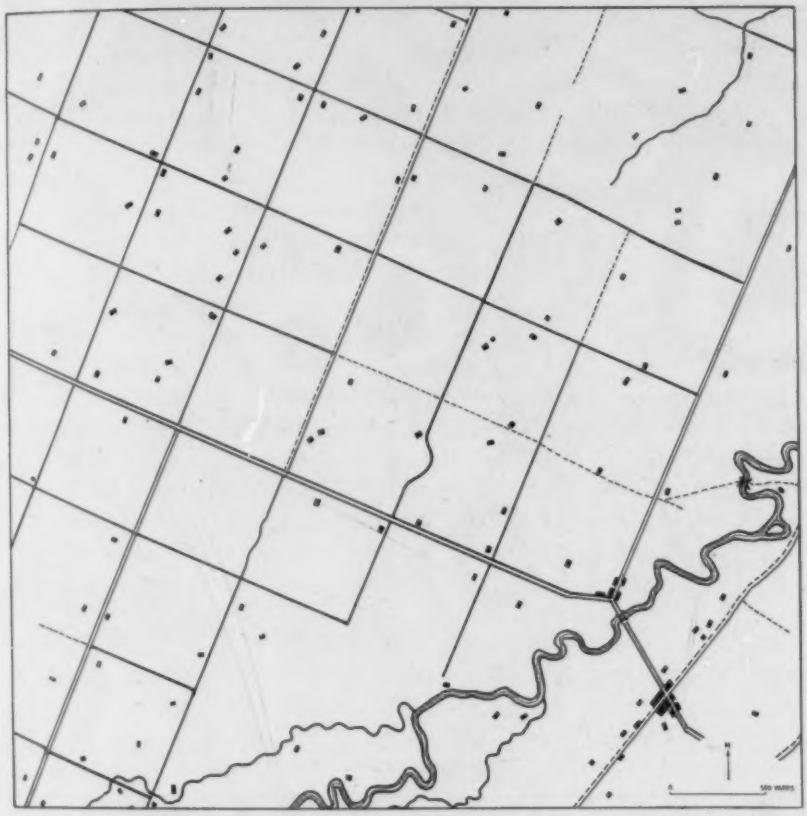

FIG. 30—Map of a part of Memuro Mura, Tokachi Plain, Hokkaido. Note the rectangular road pattern and the disseminated pattern of population distribution. Note also the small agglomerations near the crossing of the river. For legend see Figure 5. Scale 1:35,000.

The Tokachi Plain is a complex coastal and elevated delta plain whose floor is overlain with thin deposits of volcanic ash. Entrenched below this ash level are found the wide alluvial valleys of the Tokachi River and its tributary streams. Climatically, the area is characterized by short, hot summers and long, severe winters. Precipitation is low for Japan, and the maximum occurs in winter as snow.

A half-century ago the Tokachi Plain was inhabited only by Ainu tribes except for a few Japanese fishing villages along the seashore. The Ainus were a fishing and hunting people settled along the banks of the rivers. Agricultural settlement by the Japanese proceeded

inland along the same rivers until the construction of a railroad from Sapporo two decades ago. The lands nearest the rivers contain the densest populations, and the important agglomerations are with few exceptions located on the river banks.

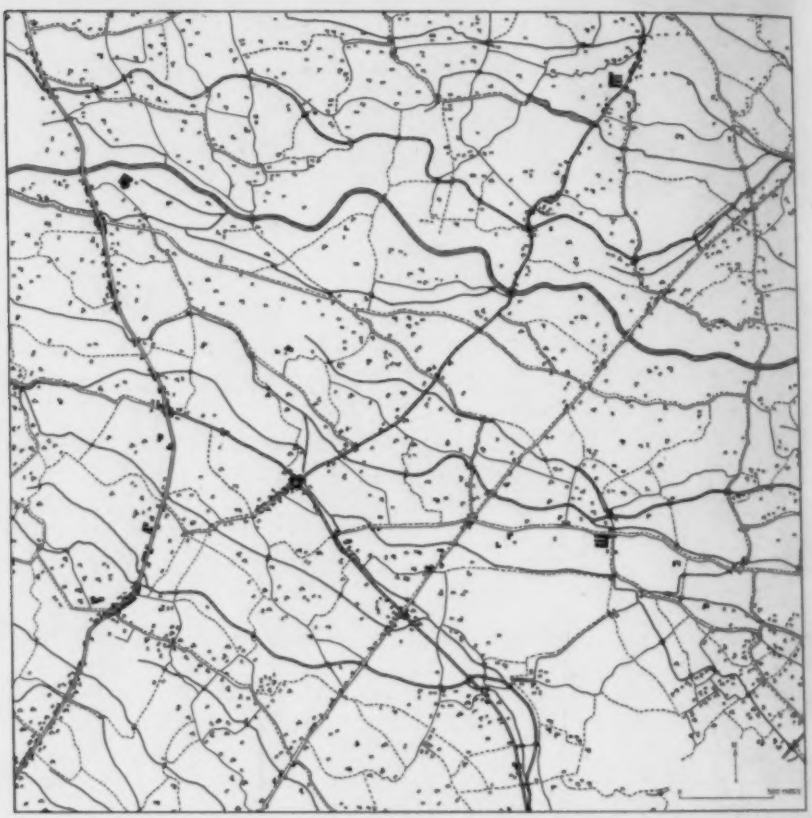

FIG. 31—Map of a part of the Oi Gawa delta showing the disseminated pattern of rural population distribution in rice lands of this steeply inclined plain. Note the frequency of the L-shaped house. For legend see Figure 5. Scale 1:35,000.

NORTH AMERICAN INFLUENCE

In the agricultural settlement of Hokkaido the Japanese Government secured the assistance of American agricultural experts, who were responsible for the introduction of a small-scale likeness of our range and township system.

A base and a range line were first established, at right angles, in each unit of low relief. These lines conformed to the lay of the land and not to compass direction. From them, parallel lines were established dividing the land into rectangular areas of 270 square cho, or 661.5 acres. These in turn were divided into nine divisions

of thirty square cho, or seventy-three and a half acres. The third, or basic, division was an oblong area of five square cho, or twelve and one-quarter acres, i.e. one sixth of the secondary unit. The system was much less regularly applied than its counterpart in the United States. The area of five square cho was presumed to support one family, and settlement was made on this basis. In 1875 and subsequent years militiamen were settled in different parts of Hokkaido to serve as an outpost against Russian advance. Each man was given five square cho, and when this was reclaimed he could petition for a further grant. Many of these families can still be identified. The grants to ordinary agriculturists, who began to arrive somewhat later, were in five-cho lots. This is still the average holding except where rice lands have been established.

Along the rectangular road pattern thus established, isolated individual farmsteads have been constructed (Fig. 28). As the density of population is low and as large areas of land are involved in the present system of dry and extensive agriculture, the population pattern is a disseminated one (Fig. 27). Some rather large voids occur where big tracts of land have been granted for horse and sheep pastures. Small areas of high density are found where paddy cultivation is established. Minor agglomerations occur in the form of the Greek cross, and T-shaped towns at the intersection of mains roads; they are comparable in structure and function to similar features found in the western United States (Fig. 30).

Lack of Homogeneity in House Types

The house types of Tokachi show little homogeneity. Settlers from all parts of Japan have migrated here and have introduced elements of their own culture. The Echigo house is well adapted to the heavy winter snows and, as the Sea of Japan area has contributed more settlers than any other part of the country, many such houses are found. Ainu houses of marsh reed and grass with protecting split-log palisades are frequently adopted by the newcomers for temporary occupation. There are still a few Ainu families in Tokachi, as well. American log cabins and frame houses characterize areas of earlier settlement. The house structure of Old Japan cannot be used in Hokkaido without difficulty. Both cedar and pine are lacking; and native woods, especially the firs, are not strong. Most of the better houses of Hokkaido are now being built of imported American woods. The heavy winter snows tend to crush flimsy structures, the great temperature changes cause warping, and the freezing and thawing of the ground pulls the framework out of line. Japanese tile is not used, as the marked temperature changes soon break it up. In most cases a large shed accompanies the dwelling unit to afford

shelter for the work animals and storage for the bulky products of general agriculture. A variety of modified western and Russian stoves are found. However, settlement in Tokachi is still in its infancy, and the rural house is still in the experimental stage aiming to preserve the chief elements of Japanese culture and still afford comfort during the rigors of the long winter.

Summary

From study of the areas discussed here and from general observation in widely separated portions of Japan, it is perhaps possible to state a few generalizations concerning forms of rural settlement in Japan.

In regard to the regional pattern of distribution, rice lands with few exceptions are occupied by small and compact village agglomerations rather evenly distributed. The form of the agglomeration is largely an adjustment to natural conditions; the structure is likely to be determined by social and economic conditions, as the kaito of Yamato and the landlord-tenant pattern at Echigo. There are at least two marked exceptions, the Toyama Plain and the plain of the Oi Gawa. The former lies southwest of Takata and is the most steeply inclined delta plain on the Sea of Japan side. The latter is in Shizuoka Prefecture and has the steepest grade of all delta plains on the Pacific side of Japan.[21] In both cases small and independent irrigation systems are used. Both areas are subject to violent floods, and unit dry point sites have been occupied. As a result a disseminated pattern of rural distribution is found (Fig. 31).

In areas of dry crop cultivation a disseminated pattern with a tendency toward agglomeration seems to be universal. The structure of the local pattern bears close relation to artificial forces, as is demonstrated in the fumato of Satsuma and the rectangular land division of Tokachi.

The Japanese rural house is distinctly an implement of agriculture and as such varies with agricultural systems. It is also a product chiefly of its local environment and so varies in construction and form with the heterogeneity of environments found in Japan. Nevertheless, the rural house conforms to the homogeneity of the Japanese culture complex. The basic Japanese house seems to be a rectangular structure of three rooms. There are many variations of and additions to the basic form, as can be noted from the different ground plans presented. Japanese tradition, like Chinese, encourages each family to live under one roof. Houses of two and three stories, containing dozens of rooms, accommodate fifty or more people of all the living

[21] A. Watanabe: On Some of the Elevated Deltas of Japan, *Geogr. Rev. of Japan*, Vol. 5, 1929, No. 1, p. 5 [In Japanese].

generations of one family. The same tradition has discouraged the building of apartment houses and tenements in urban centers despite crowded conditions. Except in Satsuma, where the rural house approaches an equilateral structure, the Japanese house is distinctly oblong in shape. On the whole it is a lightly constructed building with inadequate heating facilities and, like most material forms of Japanese culture, is well adapted to subtropical conditions and to the hot summers, which characterize all Japan, but is distinctly not suited to northern climates or the severe winters of northern and western Japan.

SAN SALVADOR ISLAND TO CUBA
A CRUISE IN THE TRACK OF COLUMBUS

Glenn Stewart

IT seems strange that in spite of the amount of study that has been given to Christopher Columbus in his discovery of the New World the actual points visited by him between his landfall and the Island of Cuba have never yet been positively determined. Most attempts at reconstructing this part of the first voyage have been made at the desk. I hoped to contribute to the solution by studying the problem in the field—by actually following the discoverer's course step by step in a small boat.[1]

With this purpose I sailed early in January, 1930, for Watling Island, which is now generally agreed upon as the landfall of Columbus and has in fact been recognized as such under the official designation of "San Salvador or Watlings Island," by an Act of Parliament (1926). The incidents of the trip before reaching San Salvador have no bearing upon the subject matter of this article other than that in sailing from Eleuthera across to Cat Island, a distance of some thirty odd miles, I had here clearly demonstrated to me the phenomena of horizon limitations which have made some of Columbus' statements so puzzling—his references to "great numbers" of islands where such do not exist. Although the chart showed on this course the three islands of Eleuthera, Little San Salvador, and Cat, from a distance they appeared as a number of small keys on the edge of the horizon. Of course what I saw was only the tops of the taller trees, and as I approached them more closely they resolved themselves into the three islands. This is exactly the phenomenon that Columbus saw, only magnified in his case as he was on the high poop deck of an old caravel while I was on the low deck of a ketch.

San Salvador Island

Referring to San Salvador Island, Columbus states in the Journal under date of October 13 that *according to what many of them told me, there was land to the S., to the S. W., and N. W., . . . This island is rather large and very flat, with bright green trees, much water, and a very large lake in the centre.* He continues (Oct. 14): *I ordered the ship's boat . . . and I went along the coast of the island to the N.N.E. . . .*

[1] I used the "The Journal of Christopher Columbus," translated by Sir Clements Markham from the text of Navarrete (Colección de los viages . . . Vol. 1, Madrid, 1825), *Hakluyt Soc. Publs.*, Ser. 1, Vol. 86, London, 1893.

But I was afraid to land, seeing an extensive reef of rocks which surrounded the island, with deep water between it and the shore forming a port large enough for as many ships as there are in Christendom, but with a very narrow entrance. It is true that within this reef there are some sunken rocks, but the sea has no more motion than the water in a well. . . . I saw a piece of land which appeared like an island, although it is not one . . . Close to the above peninsula there are gardens of the most beautiful trees . . . I saw so many islands that I hardly knew how to determine to which I should go first . . . I looked out for the largest . . . It will be distant five leagues.

FIG. 1—The course of Columbus through the Bahama Islands to the Cuban coast on his first voyage as deduced from a field study.

San Salvador has islands to the south, to the southwest, and to the northwest. It is rather large and very flat, with a lake in the center. It is surrounded with rocks and has, at the northeastern point, a reef harbor exactly answering to the description. The expression "so many islands" is accounted for by the fact that Rum Cay proper is below the horizon, its trees and headlands appearing as separate islands from San Salvador.

Upon arrival at San Salvador Island I anchored off the Government Radio Station and took on board Father Dennis, who is in charge of this diocese. Leaving with him at once we sailed for Graham's Harbor at the northeast end of the island, which we entered through a narrow break in the reef, sailing up the harbor to its extreme end, close to a piece of land that appeared like an island, although

it is not one, where we dropped anchor for the night just opposite H. M. Lighthouse dock.

It appears from the Journal, October 11 (Thursday), that *At two hours after midnight the land was sighted at a distance of two leagues*, so they shortened sail and lay by, *hove to, waiting for daylight; and on Friday . . . The Admiral went on shore.* On the night of the 11th the moon arose at 11 p. m., and at 2 a. m. would be shining brightly on the sandy shore and breaking seas of the island. On October 11 *there was more sea than there had been during the whole of the voyage.* There must have been a heavy sea breaking, which would cause Columbus to heave to promptly and work north where he could see that there was less break. In this manner, making little headway, he would be carried past the reef at the north end of the island and would then work himself south into the smoother water of the lee side. When day broke he sought for a desirable place to land, and the first rock-free anchorage close to shore with a sandy bottom and beach would be his natural point of landing. This spot is about where the Government radio towers now are at Cockburn Town.

The rock-strewn approaches to the eastern or weather side of the island make landing on that coast an impossibility. Furthermore, when Columbus (Oct. 14) *ordered the ship's boat . . . and . . . went along the coast of the island to the N. N. E., to see the other side . . . to the east*, he must have been on the western side of the island in order to do so. The opening of Graham's Harbor, big enough for all the ships in Christendom, would be what he would naturally observe rowing upon his north-northeast course. Graham's Harbor, however, is again identified by his description of *a piece of land which appeared like an island, although it is not one.* This coincidence leaves no room for doubt as to exactly where he was, and his row up the coast to the north-northeast again checks the position of his anchored ship. The curious piece of land like an island is really the big end of a peninsula whose neck is submerged except at low tide. Graham's Harbor is an excellent reef harbor. During a heavy norther we lay at anchor there for several days in perfectly smooth water.

Santa Maria de la Concepcion, or Rum Cay

Leaving San Salvador Island we headed for Rum Cay, as the text of the Journal indicates Columbus did. He sailed at dawn, arriving at the large island he had headed for about noon, running according to his estimate seven leagues: on the chart the distance is about twenty-one miles. He states (Oct. 15) *that side* [of the island] *facing towards the island of San Salvador trended north and south with a length of 5 leagues, and the other which I followed ran east and west for more than 10 leagues.* While the trend of the coast lines and the distance

from San Salvador agree closely, Rum Cay actually measures five miles by a little less than ten miles. This suggests that the transcriber of the original log made the mistake of writing leagues instead of miles (Columbus used both leagues and miles) and that Rum Cay is no other than the island Columbus named "Isla de Santa Maria de la Concepción." Here he landed, taking formal possession of the island for Spain, and sailed shortly after to the west for Fernandina (Long Island). An additional check on Rum Cay is given us in the distance to Long Island and a description of its shore when he says (Oct. 15) that *The distance of this island* [Fernandina or Long Island] *from that of Santa Maria* [Rum Cay] *is 9 leagues on a course east to west. All this part of the island* [Long Island] *trends N. W. and S. E.* On arrival (Oct. 16) he placed the distance as eight leagues.

Fernandina or Long Island

Arrived at Long Island, Columbus anchored off an Indian settlement for a short time; thence he sailed to the north-northwest intending to go around the island (Oct. 17). The breeze was light, and morning found him about fifteen miles south of the northern point of Long Island. Sailing a north-northwest course to go around this island he noted a harbor a few miles south of this cape but found it too shoal for his boats. This harbor is indicated on the large-scale charts by two small black dots or islands and is only used by local fishermen. As he proceeded north-northwest from here, weather conditions forced Columbus to give up his attempt to sail around the island westward; hence he returned to east and south and, sailing all night, reached the south cape of Long Island where he anchored. He named the point Cape Verde.

Isabella or Crooked Island

When Columbus left Cape Verde (Oct. 19) he sailed east to an island the natives told him lay in that direction where lived a powerful king with much gold. *We saw an island to the east . . . arrived at the north point . . . Here there is an islet, and a reef of rocks to seaward of it, besides one between the islet and the large island. The men of San Salvador, whom I bring with me, called it Saomete, and I gave it the name of Isabella. The wind was north, and the said islet bore from the island of Fernandina, whence I had taken my departure, east and west.* The island is Crooked Island, the islet Bird Rock.

From Bird Rock Columbus *ran along the coast of the island, westward . . . as far as a cape, which I named Cabo Hermoso, at the western end.* This cape is at the southwest tip of Fortune Island, Fortune Island being separated from Crooked Island by a narrow passage. *From this point* [Cabo Hermoso] *to the N. E. the coast makes*

a great angle. This great angle is the very deep bay to the point where Crooked and Fortune islands are separated. Columbus comments on this: *This cape, to which I have given the name of Cabo Hermoso, is, I believe, on an island separated from Saometo, and there is another small islet between them.* This is exactly so, there being such an islet in the passage between Crooked and Fortune. The Journal proceeds (Oct. 20): *I weighed the anchors from where I was with the ship* [Cabo Hermoso], *and anchored off the S. W. point of the island of Saometo* [Crooked Island], *to which* [point] *I gave the name of Cabo de la Laguna.*[2] Columbus then returned to Bird Rock and anchored in the reef harbor.

Upon arriving at Bird Rock, where there is a fine large lighthouse, I found a good reef harbor between Bird Rock and Crooked Island. This reef harbor is similar to Graham's Harbor at San Salvador Island. Crooked Island has low hills about 200 feet high and is richer than any of the other islands we have passed. It must have been a wonderful place in the old slave days, and it has many ruined stone slave pens and ruined mansion houses. We skirted south and west down the island in beautiful still water, past the small passage between Crooked and Fortune islands described by Columbus when he named the southern point of Crooked Island "Cabo de la Laguna." All is as he described it. The accuracy of his descriptions is a constant source of surprise and pleasure, authenticating the very things we were looking at. From Cabo de la Laguna we sailed more to the westward to where Cabo Hermoso stands out prominently on the horizon. It is a sort of high double hill ending in a little level projection.

Islas de Arena, the Ragged Islands

From Bird Rock Columbus set sail for Cuba. His sailing directions on this run are unusually specific; he says (Oct. 24): *At midnight I weighed the anchors and left the anchorage at Cabo del Isleo* [the reef harbor at Bird Rock] . . . *I shaped a course W. S. W.* . . . [past] *the Cabo Verde of the island of Fernandina, which is at the S. W. end, bore N. W. distant 7 leagues.* These sailing directions are checked by his position relative to Cape Verde. From this point the next lands sighted on his course here west-southwest and west were *7 or 8 islands, the group running north and south* (Oct. 25). *The ship was on the south side of the islands, which were all low, distant 5 or 6 leagues. I anchored there* (Oct. 26).

The description of these "Islas de Arena," fits precisely the Ragged Islands. Following in his track we sailed to Cay Verde (Green Key), the southernmost of the Ragged Island group, and,

[2] Compare Navarrete: "Hoy al sol salido levanté las anclas de donde yo estaba con la nao surgido en esta isla de *Saometo* al cabo del Sudueste, adonde yo puse nombre el *Cabo de la Laguna*" (p. 35).

taking it as a point of departure and following a south-southwest course as indicated by Columbus in his Journal of October 27, we headed for Cuba.

The Cuban Landfall

After we had gone a short distance the wind conditions became bad, and we set our course for Nipe Bay, the nearest Cuban port, which we made about 11.30 at night.

In the determination of Columbus' Cuban landfall we have a known point of departure in the Ragged Islands and a known course, but unfortunately this known course cannot be followed literally. What was south-southwest to him does not mean south-southwest to us today, because of the change in magnetic variation and because of the local ship's magnetism, for which he made no correction. Moreover Columbus knew nothing of the currents. The old Bahama Channel current which flows westward along the north coast of Cuba is weak and can under certain weather conditions give an eastward set. Whether Columbus actually entered Nipe Bay or not is a question that can be best checked by his descriptions of what he found when he reached Cuba and when he left his landfall on that island.

The Journal is now entirely filled with the wonders of the New World of Cuba. There are no Indians today, but otherwise things have not changed a great deal: except for the cane fields Cuba must look much the same. Feeling, as I do, that Nipe Bay was the *very beautiful river without danger of sunken rocks or other impediments* (Oct. 28), it is interesting to see how his later descriptions of the place apply. *All the coast was clear of dangers up to the shore. The mouth of the river was . . . wide enough for a vessel to beat in.* The Admiral called his port of entry San Salvador.

When (Oct. 29) *The Admiral weighed anchor from this port and sailed to the westward . . . They doubled a point six leagues to the N. W.* [Punta de Mulas], *and then another point* [Sama Point], *then east ten leagues. After another league* [to the east] *he saw a river with no very large entrance, to which he gave the name of Rio de la Luna* [Banes entrance]. *He went on* [east] . . . [and] *saw another river* [Port Cabanaco] *much larger than the others* [Banes].[3]

The context later on in the Journal leads one to believe that this was where he dropped anchor for the night. Certainly it is a full day's run and the logical thing to do. His second anchorage in Cuba, Rio de Mares, would then be Nuevitas Bay.

A south-southwest course from the Ragged Islands to Cuba, which

[3] The identifications are those of Navarrete. The text referring to the departure from the landfall runs: "Alzó las anclas de aquel puerto y navegó al Poniente. . . Una punta de la isla le salia á Norueste seis leguas de allí, otra punta le salia al Leste diez leguas" (p. 42).

is only a run of about 75 miles, does not leave a great deal of room in which to find conditions answering the above descriptions, and the descriptions of what the Admiral saw upon leaving his first anchorage of San Salvador tally closely with the coast of the Nipe Bay district. With my arrival there I felt I had completed the object of my cruise.

The Need of Investigation in the Field

The course of Columbus' first voyage from the first landfall to Cuba presents so many problems that it has been held incapable of solution, and there have in fact been almost as many solutions as would-be solvers. We do not have the original of the Journal to work with but only the précis and extracts transcribed by Las Casas and published by Navarrete in his "Colección de los viages" (1825). The instruments of navigation used by Columbus were extremely crude, and before his day the variation of the magnetic needle was unknown. He is generally credited with its discovery.[4] It is indeed possible to estimate the magnetic variation of the time[5], but the matter of correcting for local magnetism of the ship cannot even be guessed at. Columbus' course was laid off in utter ignorance of the currents of the Bahamas, for which he made no allowance.

Early investigators were further handicapped by the lack of reliable maps. Even with our modern charts there are a number of elements to be considered that can only be determined in the field. To plot Columbus' track in the study is to be without the touchstone of actually seeing what he saw and described. However, it is gratifying for me to note such confirmation of my identifications as is afforded in Lieutenant-Commander R. T. Gould's excellent recent paper.[6]

The value of observations on the spot is illustrated by a point to which reference has already been made—the puzzle of the many islands. The observers who have studied the problem in the field naturally arrive at the correct explanation.[7] The observations of Rudolf Cronau who went over the ground as far as the Ragged Islands in 1890 are in perfect accord with my own conclusions, though I was unaware of his work at the time of my voyage.

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[4] Compare J. P. Ault: The Purpose and Progress of Ocean-Surveys, *Scientific Monthly*, Vol. 26, 1928, pp. 160–177. But compare also Cecil Jane: The Question of the Literacy of Columbus in 1492, *Hispanic Amer. Hist. Rev.*, Vol. 10, 1930, pp. 500–516; reference on p. 502.

[5] Cf. Charles A. Schott: An Inquiry into the Variation of the Compass off the Bahama Islands at the Time of the Landfall of Columbus in 1492, *U. S. Coast and Geodetic Survey Rept. for 1880*, Appendix No. 19, Washington, 1882.

[6] R. T. Gould: The Landfall of Columbus: An Old Problem Re-stated, *Geogr. Journ.*, Vol. 69, 1927, pp. 403–429. See especially the map showing the relative positions of the five islands sighted by Columbus superposed upon a modern chart of the Bahamas, p. 423.

[7] F. A. Ober: In the Wake of Columbus: Adventures of the Special Commissioner sent by the World's Columbian Exposition to the West Indies, Boston, 1893. See p. 92. In relation to the identifications in general see also his reference to the Chicago Herald Expedition of 1891 of which an account appeared in *The Chicago Herald* for July 4, 1891.

Rudolf Cronau: The Discovery of America and the Landfall of Columbus: The Last Resting Place of Columbus, New York, 1921. See pp. 29–31.

FRENCH COLONIAL POLICY IN THEORY AND PRACTICE: A REVIEW*

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THESE two large volumes, packed with information and representing a vast amount of labor, are deserving of much praise. In a work of this category errors are inevitable. There is a minor mistake in the history of Algeria's railways.[1] More serious is the misstatement as to the European population of Algeria in 1921.[2] However, in this very conscientious work it is not so much the errors in the use of the material Mr. Roberts has had at his disposal as in the nature of that material itself against which criticism must be leveled. In his preface Mr. Roberts points out that "the book does not pretend to be an interpretation based on actual colonial experience: it is a piece of historical research . . . one can write of the Middle Ages without having lived in them." Assuredly: yet to treat the present as one would treat the Middle Ages is a method which has its dangers. They are particularly grave for a stranger who seeks in Paris his source material on French colonial policy.

Paris Versus the Colonies

The French colonial empire of today is almost entirely the work of the Third Republic, and Mr. Roberts has quite properly confined his study within the limits 1870–1925. But the Third Republic, unlike the Second Empire, has never been a strong power. It is the very feebleness of the central authority that has given the opportunity for individual initiative. To understand what has happened one must look in the colonies themselves, rather than in Paris. An example from Mr. Roberts' book will illustrate the point.

Algeria in the final years of last century was granted financial autonomy and a kind of parliament, the Délégations Financières. Mr. Roberts (p. 186) analyzes the evolution of the ideas and measures

* S. H. Roberts: History of French Colonial Policy (1870–1925). Vol. 1, xvi and 374 pp.; maps, diagrs.; Vol. 2, viii and pp. 375–741; maps, bibliogr., index. (London School of Econ. and Polit. Sci., Monograph 95.) P. S. King & Son, Ltd., London, 1929.

[1] "By 1900 there were only 2,400 kilometres, in a network along the coastal fringe and with one southern extension to Tuggourt" (p. 248). As a matter of fact the southern extension to Tuggourt dates only from 1913; on the contrary, southern extensions from Constantine to Biskra and from Oran to Colomb Bechar were in existence at this date.

[2] Mr. Roberts gives figures (p. 237) for the European (French and foreign) population of Algeria for 1906, 1911, 1921 respectively as 615,000; 751,000; 597,000. The actual statistics are: 625,000; 675,000; 715,000.

which led to this important step, "a goal of reformers," he says, from Marshal Randon (1854) and by a "paradox" supported by such an anticolonial as Viviani (1899). He treats of an event which has taken place under my own eyes, and it seems to me clear that his Parisian sources have obscured the reality. Viviani was a left wing politician of the anticolonial party; but is Mr. Roberts aware that he was born in Sidi-bel Abbès (originally of a Maltese family, I believe) and always kept in close touch with Algeria? When he advocates the Délégations Financières it is not the Socialist who speaks but the Algerian. The Délégations Financières were not the result of the mature consideration of the central government but of Algeria's violence. Incidentally Mr. Roberts speaks of the provocative anti-Semitic riots. I doubt if he appreciates their real significance. They were occasioned by an economic condition—a crisis in the wine industry, which was manifested at the same time in the home provinces where the vine is more or less a monoculture as in Algeria—in Montpellier, the viticultural capital of the Midi, in Aube, in the vine country of Champagne for instance. Though an ordinary economic disturbance, it had considerable and immediate political consequences. A strong government, such as that of the Second Empire would have squelched it immediately. The government of the Third Republic yielded and created the Délégations Financières.

Mr. Roberts is impressed by the explosion which led to the downfall of Jules Ferry. "Ferry the traitor . . . Ferry, the Tonkinois . . ." say the contemporary texts. But for a Frenchman Jules Ferry is rather the creator of the lay school, anticlericalist leader of the opportunist party that so long held the reins of power against the conservatives on the one hand and the radicals on the other. Of course he was the conqueror of Tunis and Tongking, or at least the man in power when these conquests were made; but this side of his career is overshadowed. The accumulated hatred of domestic politics erased the colonial incident. France did not evacuate Tongking nor modify its policy therein the least: it has continued as incoherent and as expansive as before.

The Colonial Press

There is another reason why an exclusively Parisian bibliography is a source of error. Mr. Roberts has properly emphasized the fact that at Paris the French colonies are under three entirely distinct ministries—the Ministry of the Interior (Algeria), the Ministry of Foreign Affairs (Tunisia, Morocco, the Syrian Mandate), and the Ministry of the Colonies (the remainder). He appreçiates the indifference of the public to the colonial press in Paris, pointing out for instance that in 1914 the Comité de l'Afrique Française had only

4000 adherents. But he does not appear to connect the two facts. How does a press without readers survive? There is no secret about it: it is officially subventioned. By whom? By three different and rival administrations, each of which pushes its own interests to the detriment of the others. To accept without question a press so organized is, to caricature the situation a little, as if an economist studying the soap industry should lend his attention exclusively to the rival claims of Bébé Cadum and Palmolive. Here is an example.

Mr. Roberts is particularly severe on Algeria, "a kind of whipping-boy for the rest of the colonies". (pp. 257–258). France, he says, "was able to fare better in Tunisia, West Africa, Madagascar, and even in Indo-China." For fifty years since the protectorate over Tunisia was established there has been verbal warfare between Algeria and Tunisia, and for the last twenty years Tunisia has had the support of Morocco. Tunisian as well as Moroccan propaganda has always been admirably conducted; first because it has had the support of an uncontrolled beylical budget; secondly because the idea of "protectorate," an attenuated form of colonization, is less discordant with French instinct than colonization pure and simple. In any case the inferiority of Algerian propaganda is striking. The Parisian public has always had a preference for Tunisia and Morocco.

However, it may be noted that within recent years, which do not fall in Mr. Roberts' program, public opinion has veered. The ancient faith in the protectorate formula has been broken by certain ineluctable facts. France has become aware of difficulties to be faced in Tunisia that do not exist in Algeria. For instance, there is the excessive number of Italian agriculturists, because the protectorate has heretofore preferred large-scale colonization—what is known in Algeria as colonization "in yellow gloves"—and there is the appearance of a "Young Tunisian" spirit, an import from Young Egypt. In Tunisia itself one hears praise of Algeria in the mouths of colonists and functionaries. The protectorate, furthermore, has borrowed from Algeria, as far as it can, methods of colonization. A tourist has only to cross the frontier to sense the difference in the atmosphere, with advantage to Algeria.

In Africa, and even in Paris today, it is less and less possible to find so harsh a judgment pronounced on Algeria; yet Mr. Roberts interpreted it correctly from the sources at his disposition.

Comparison of French and English Colonial Policy

The prime interest of Mr. Roberts' treatise is the comparison, by a colonial Englishman, of French and English colonial methods. Mr. Roberts has made a careful study of French theories of colonial relationships. Such theories do exist in Paris, for the Frenchman is

an intellectual and a logician, and French colonization has been a subject of study since Louis XIV. A first French colonial empire existed in the seventeenth and eighteenth centuries when France disputed the Indies and North America with England. But this empire died in 1815 as completely as the German colonial empire (perhaps one should say the first German colonial empire) in 1919 and for the same reason—defeat. The second French colonial empire is a phenomenon of the present, and I am not sure that it has a traditional rapport with its predecessor. Between the two, lies a century of blood and fury. In its course the first colonial empire has been well-nigh forgotten; perhaps it would be better to leave it in the archives.

"The famous law of January 11, 1892, extended this protective principle [tariff assimilation] to be the general basis of French colonial organization," says Mr. Roberts (p. 44) and notes (p. 57) the protestation against this law registered at the Colonial Congress at Marseilles in 1906: "The colonies were dying because they were being linked to France too closely. Their organs are constricted by the tight corset of ultra-protectionism." Mr. Roberts sees in this system a survival of the old "Pacte Colonial" which functioned in the seventeenth and eighteenth centuries. It is simply the general question of protection or free trade. Is it certain that protection is a legacy of the past to which France alone remains faithful? Is it certain that England even, after a century of free trade, will not in the presence of a new world situation return as far as possible to protection with that admirable suppleness of which she has given so much proof?

National Temperaments

What has not changed from the first colonial empire to the second is the national temperament. Mr. Roberts justly stresses (p. 653) that "there, England and France . . . stand poles apart. The French come more into contact with native life. They impregnate themselves with the traditions and thought and peculiarities of the native mind, and endeavour to understand. The English, on the other hand, stand aloof." "It is no mere hazard," continues Mr. Roberts, "that England completely lacks the class of colonial literature that France has so abundantly." He cites the French colonial novelists—Claude Farrère, Isabelle Eberhardt, Louis Bertrand, and other lesser writers (p. 655); adding shortly, "In the same field, England has *Kim* and little else." I would not go quite so far. We, in France, are great admirers of Kipling; and to have one Kipling in the field of colonial literature is a matter of significance. It is possible that the truly colonial part of Kipling's work has had more of a responsive echo in France than in England.

Mr. Roberts is right a thousand times in his observation that "the French draw no colour line" and are loath to admit "any innate racial inferiority." He adds that the Frenchman finds himself helped by his Latin temperament. There also he is right, but he puts it too shortly. It is easy to show how French sentiment is enrooted in the racial origins of the French nation.

France is the great open gap between the Alps and the Pyrenees through which the Mediterranean world and northern Europe freely communicate. On French soil as nowhere else the Mediterranean and Nordic races have mingled intimately for centuries. Charlemagne was Germanic and Napoleon Corsican—the two great national heroes. France is a nation and not a race. North African Berber blood has flowed in the veins of our Languedoc folk since the Arab invasions of the eighth and ninth centuries.

It is merely a matter of degree; and France, more than any other nation in the world of western civilization, is a mixture. Note, for instance, the difference in physical type between a Fleming of Dunkirk and a Marseillais and the gradations between these types. There is an English physical type. There is no correspondingly well marked French type. The Frenchman is what the naturalist would call a poor zoölogical species, difficult to define and to classify. You cannot ask such a one to have pride of race: it means nothing to him.

Accessory geographical circumstances contribute to the same end. In South Africa the white man is in immediate contact with a negro society. In the United States, to say nothing of the earlier effect of the indigenous population, there is a negro *bloc* and the menace of a yellow immigration against which the Pacific Ocean is in itself an insufficient protection. Under such conditions development of a color prejudice was natural, a defensive reflex. France is separated from negroes by the Sahara, a barrier of remarkable strength. The idea of an Annamite or Chinese migration to France is obviously absurd. The French can regard the yellow and black races with equanimity, almost as if they were inhabitants of another planet.

For over a century our natural instincts have been crystallized in the principles of '89 and the declaration of the rights of man. Mr. Roberts has seen the practical importance of these principles without distinguishing the double import. The new religion of the equality of races has colored the soul of all Frenchmen, even those who remained staunchly Christian and Catholic, removing the idea of horror with which our fathers of the Middle Ages regarded Islam. Among the Spaniards there is no color prejudice, but the religious prejudice holds. Spanish distaste for the Moslem has greatly embarrassed Spanish colonization in Morocco. In the attitude of a Lloyd George towards Turkey I am not sure that religious prejudice is not the source

of a misjudgment that has had political consequences. In sum and by a convergence of causes the French in their relations with native peoples are strangers to a certain aloofness of attitude which is characteristically British. The radical difference of colonial methods is a difference of temperament. "In the difference lies the whole root of the matter," as Mr. Roberts observes. This is the point of departure for a comparative study.

What are the practical consequences of the inherent difference of these two methods or two temperaments? What are their respective advantages and disadvantages? Mr. Roberts has no hesitation. All his preferences are for the English temperament. Many Frenchmen will agree with him.

We understand Mr. Roberts very well when he criticizes the principle of representation in the Chamber of Deputies and the Senate (p. 78 *et seq.*). In principle it is absurd that negroes and Hindus, for instance, should sit in the French parliament, "one of the curiosities of European colonization, something unique in colonial annals." It is a fact that in the colonies voting is a parody, an electoral farce, something to evoke American caricatures on Darktown. But it is likewise true that this hurts no one: it is inoffensive if comic. It would be otherwise if the system became generalized; but it will not, it has been condemned by experience. French West Africa has some 12 million negroes, of whom 20,000 have electoral rights. It would be impossible to extend the franchise to the entire population. With touching logic we have sought to apply the principles of '89 to blacks and yellows, hurling ourselves against infrangible reality. By the side of our system, so easy to ridicule, Mr. Roberts sets the English system of representation in local autonomous assemblies. In the light of current events it may be that the English system appears more dangerous than the French and, indeed, scarcely less ridiculous. England in all seriousness asks the babus of Bengal to elect a Hindu parliament to govern India. For millenniums India has governed itself by procedures that have become instinctive—its castes, its Brahmans, the sword of its rajahs. Certainly a Hindu parliament is better placed at Calcutta than at Westminster; but a parliament needs an electorate, and one asks if it can be found on the banks of the Ganges.

The French error is not in proclaiming the equality of human races—a theoretical postulate of high moral value: it is the implicit conclusion that, being equal, they are similar. England commits an identical error. She asks the Hindus to govern as they would if they were Europeans. It is curious that French and English, despite their temperamental differences, manage to reach the same impasse. Perhaps we may conclude that colonial government is a complex problem, however one approaches it.

The Case of Algeria

It is impossible to follow Mr. Roberts in his very detailed analysis. But his conclusions merit a careful attention. In our empire Algeria naturally holds first place; and, as has been already remarked, Mr. Roberts reserves for it a particular severity. Under the heading "The Post-War Crisis," he employs the strongest terms . . . "actual breakdown . . . the country rushed headlong to ruin . . . heavy cry of distress . . . whole regions . . . threatened to revert to the original desert . . . the economic barque of French colonization in Algeria is close to the rocks, hampered both by storm and its own inherent lack of power, and drifting helpless, in good or bad seas, without immediate hope of getting to land . . ." (pp. 251–253).

This is a horrible picture, not a little startling to one who has lived thirty years in Algeria. I would not deny the great seriousness of the after-the-war crisis in the metropolis; but our colonies, with Algeria at the head, on the contrary entered on a period of distinct prosperity. That is the general sentiment with us. But in these matters why trust to sentiment? Let the figures speak.

From 1911 to 1927, according to three successive censuses, the native population has grown from 4,700,000 to 5,200,000—an increase of 10 per cent. The European population has grown from 675,000 to 833,000—an increase of about 20 per cent. The census of 1911 must be taken as the point of departure; for there was no census in 1917 on account of the war, in which it must be remembered Algeria took an active part.

Of these 833,000 Europeans 657,000 are French against 175,000 aliens—figures, however, without great significance, because for the last thirty years the children of aliens are automatically naturalized and by schooling, military service, and intermarriage become indistinguishable from the rest of the population.

The figures likewise show economic progress since the war. In 1919, 1920, and 1921 the total value of trade oscillated around three milliard francs paper (Mr. Roberts' figures); in 1924 it reached over five and a quarter milliards and in 1929 approached eight milliards. And we may add that the volume of exports and imports in 1929 increased by a million tons over the figure for 1928, itself showing considerable increase over preceding years.

Mr. Roberts says (p. 657) that "the French have been successful with negro populations but have failed with Mohammedan." In French West Africa there is great admiration for the administrative work of the English in Nigeria, the Gold Coast, the Egyptian Sudan. There is no feeling of French "superiority." Is it possible to make the dogmatic assertion that English policy is superior in Moslem coun-

tries? Here again it seems to me Mr. Roberts betrays his ignorance of Algeria. He speaks of the Algerian Moslem ". . . hating France with the accumulated hatred of four generations . . . breakdown of her native policy in Algeria . . . fundamental error . . . policies of *refoulement* . . . disintegration and suffering and struggle . . . charnel-house of massacred natives . . . policy of attrition . . . came to drift in a helpless lethargy of pessimism, with their past uprooted, their present miserable, and their future bleak . . . inertia of despair, fading off naturally into disaffection . . . passive instead of actual insurrection . . ." (pp. 189–194).

When one has lived thirty years in Algeria in intimate daily contact with the Mohammedans in perfect peace and cordiality, it is hard to take seriously this sinister picture. Mr. Roberts has made a meritorious effort to assimilate the history of Algeria; but I suspect that he has had to work a little too hurriedly. He fails to appreciate what seems to me the essential fact in the history of Algerian colonization.

Under the Second Empire Napoleon III applied to Algeria so-called English ideas; the country was to be an Arab kingdom united to France by the personal bond of a sovereign, the natives being left to themselves and protected against the influx of European colonists—a partial anticipation, as it were, of dominion status. This system was applied for a dozen years. The result was peculiar. During the period of undisturbed peace the numbers of the Mohammedan population decreased by one-fifth. Beginning in 1872 European colonists were given elbowroom and at the commencement of 1897 a measure of political power, the Délégations Financières no less!

The barrier has been broken down between the two societies. There is a closer mixture than anywhere else between Europeans and Mohammedans, and the latter have increased from two millions in 1872 to over five millions in 1926.

In any event how does Mr. Roberts reconcile these figures with his picture of frightful oppression engendering inexpiable hatred? There is no sure thermometer to measure a people's sentiments, and this is not the place to essay a psychological study of the Moslem Algerian; but there are certain well known facts.

During the war hundreds of thousands of Algerian, Tunisian, and even Moroccan Mohammedans served in the French army; while at the same time England dared not put a rifle in the hand of an Egyptian. I found open disaffection in Cairo in 1917. The newspapers for years have been full of unfortunate incidents attesting the difficulties of England with her Mohammedan subjects or protégés; in Egypt, Palestine, India. In the light of such facts is not Mr. Roberts' thesis in the nature of a pleasantry? Not all of these incidents are of grave significance, but I suspect they are provoked by

that English policy so dear to Mr. Roberts. I refer to the policy of native rule. Does England really and sincerely intend the definitive evacuation of Egypt and Palestine, which guard the Suez Canal; and of India, with its 300 million customers for British industry? She does not wish to do so; nay, she could not conscientiously do so, for her departure would be a catastrophe. Is it wise then to give Oriental imaginations hopes that cannot be consummated?

A passage in Mr. Roberts' book strikes me as being amusing (p. 96): "Colbert . . . had proposed . . . 'completely to exterminate' the Iroquois." I was not aware that this monster Colbert had such black designs. And fortunately Australia had not yet been discovered, or he would doubtless have proposed completely to exterminate the Tasmanians. In fact it was reserved for English civilization practically to exterminate Iroquois and Tasmanians. But it never proposed to do so. Here is a peculiar trait of British psychology. It is not that I condemn the suppression of the Iroquois: I merely point out that it was not pursued openly as an avowed object.

Our fathers spoke of perfidious Albion. Today we understand the English better, and we have read Bernard Shaw. In the Englishman's brain the domain of very sincere convictions has no communication with that of instinctive defensive reflexes. The Englishman is not troubled by the logic which often embarrasses the Frenchman. In the case of the policy of native rule is it not the defensive reflex that is in operation?

England faces a grave economic crisis. The necessity of economies is imposed on her. The solution of native rule permits her to preserve and even increase the commercial exploitation of the empire while diminishing the general expenses by reducing military expenditure. A useful expedient, though it seems to us to bristle with difficulties.

French North Africa Compared with South Africa

It is perhaps a little unfortunate that Mr. Roberts is an Australian. Not only is Australia very far away, at the antipodes of the Mediterranean, but it has a homogeneous population without parallel in the French colonial empire. Mr. Roberts would perhaps have understood French Africa better had he been an Afrikander.

There are several resemblances between British South Africa and French North Africa—of climate, of the mixture of peoples. Detailed comparison between the two would be instructive and probably not altogether to the disadvantage of French Africa. The native populations, it is true, are very different; but numerically they are comparable—about fifteen millions in South Africa, twelve millions in French North Africa. There are, I believe, 1,600,000 Europeans in South

Africa; but it has taken three centuries to assemble them. French North Africa had 1,100,000 at the last census, established in a third of the time. South Africa is famous the world over for its precious minerals—gold and diamonds. Yet we must not overlook the rôle of that more humble mineral, the phosphates of North Africa, which has no European competitor and already is cutting into the European market for American phosphates. What say the Belgian and German and Polish peasants who have doubled their harvests on north African phosphates? But I must not continue this tempting theme which has failed to attract the Australian Mr. Roberts.

South and North Africa are two ends of the same continent; and, far apart as they are, they have a common bond. "France," says Mr. Roberts (p. 677), ". . . dreams of a North Africa . . . linked on to a black Empire to the South . . . Imperialistic visionaries." Would Mr. Roberts have passed such a judgment if he had been an Afrikander, with the continent forcibly imposed on his attention? This enormous massif whose natural highways, the great rivers, are interrupted by falls and rapids: does he think it can always be served by the sea? A railway system is needed, and it advances rapidly not only in South Africa but in Central Africa and the Belgian Congo. Doesn't he see that some time it must be tied on to the European net? The Cape-to-Cairo line leads to the eastern Mediterranean—to Greece, Constantinople, the Black Sea. Via a Strait of Gibraltar tunnel the African net could be directly connected with the great capitals of western Europe. This is the French trans-Saharan project. I doubt if it is an imperialistic vision; and it is possible that it will materialize before very long. A commission that has studied the project concludes that its construction would require a dozen years and cost three milliard francs paper—an annual cost of 300 millions, and France has a budget of 50 milliards.

We have long since forgotten the bitter English opposition to the construction of the Suez Canal . . . Lord Palmerston, for instance, putting the house of Commons on guard against that Suez swindle. And then, mon Dieu!, the canal was cut, and England found it very useful. When the trans-African project functions England will also find it useful. Mr. Roberts, if he were an Afrikander instead of an Australian and if he is, as I hope, younger than I, might one day go from Cape Town to London in an unbroken railway journey.

Colonization and Civilization

If I have a general criticism to make of Mr. Roberts' book, it is that he has treated his subject too exclusively as a national and imperialistic question. But this is not a criticism to level specially at Mr. Roberts. No one who speaks of colonization looks at it from a

general viewpoint. Yet the phenomenon of colonization considered in itself is a magnificent and stirring spectacle. About four centuries ago in that epoch called the Renascence the extremity of this little Asiatic peninsula that we call Europe had accumulated an enormous store of intelligence, capital, industries, armaments, in a word, of power. We have long called that civilization European; it would now be prudent to call it western. That great pent-up energy, released by Vasco da Gama and Christopher Columbus and augmented by undreamed-of sources of power, spread over the world. It submerged America to such an extent that the North Americans can now claim, perhaps with justification, to be its most characteristic representatives. In the nineteenth century western civilization conquered two new continents, Africa and Oceania. In the twentieth century comes the turn of old Asia, mother of ancient civilizations: a dilemma confronts her, to westernize herself or be westernized.

What a drama! Surely it reduces to their due proportions our national prides and our imperial soarings. There exist the data from which to formulate the general law that we all obey when we believe ourselves led on by greed and desire. Think of the variety of colonizers from the Portuguese and Spaniards of early days to the Japanese of today! Under the veil of personal concerns, noble or ignoble, all are mysteriously swept away by this imperious law.

It is a law of history analogous to the physical law of fluid equilibrium. If, at any restricted point on the globe, force is accumulated in excess, it must be released until equilibrium is restored. This restoration is the vehicle of what we call civilization. In the general scheme of things humanity appears to tend towards a certain unity—the result, maybe, of a process of fermentation.

Colonization is the expression of this fermenting process, at least one of its expressions. Another probably is barbarian invasion, the inverse modality: when civilization is no longer able to impose itself on distant barbarians, they come to seek it. We ourselves are now in full tide of colonization. When it ends, it would be instructive to consider it as a whole, dispassionately, scientifically. It will make a fine chapter in our history. But as yet, with passions still burning, we are far from writing a world history.

THE CENTENARY OF THE ROYAL GEOGRAPHICAL SOCIETY

Albert Perry Brigham

FROM Britain, from the continent, from many countries over the seas a great company gathered in London on October 21 to October 23, 1930, to celebrate the achievements of a hundred years. Third in order of founding of the great geographical institutions, the Royal Geographical Society began its work when the interiors of Asia, Africa, and Australia were largely blank on the map and when polar search had made but small beginnings. More active than any other group in finding out the world, while fostering systematic and educational geography in its later decades, the Society has a richly storied past. Interest in the proceedings of the Centenary was at a high pitch, and the preliminary organization was so complete that an almost faultless program was carried out.

There were about seventy delegates from foreign geographical organizations, representing some thirty-five countries and dependencies, and about thirty delegates from kindred British societies and institutions. To one who shared in the Transcontinental Excursion by which the American Geographical Society marked its sixtieth birthday in 1912, it added interest to find among the delegates de Margerie, Drygalski, Ogilvie, Oberhummer, and Teleki.

The Happy Start

Like every other great institution, the Royal Geographical Society finds its beginnings several years before the date of its founding. Even as long ago as 1662 the Royal Society of London had included geography in its sphere and had aided exploration. As far back as 1788 the African Association came into being, and its aims were wider than its name. The Raleigh Travellers' Club, founded in 1827, was an incipient geographical society. Leading journals began to see in geography a science: the Paris Society had been founded in 1821, the Berlin Society in 1828, and the time was ripe in 1830 for the London undertaking.

That the young society took its work seriously appears in the holding, during its first year, of thirty-three Council meetings. This, we take it, is not likely to happen in London or anywhere else in the year 1930. The first treasurer possibly knew human nature very well, when he said, of one of these early meetings: "The real great men speak but little; it is the pretenders to knowledge who speak most and, not being men of business, do nothing but doubt, interrupt, and perplex." It is a great-grandson of the first treasurer who now holds this same office, Lord Biddulph.

The first and last-named of the ten founders, as listed by Dr. Mill, were John Barrow and Roderick Impey Murchison. An early president was Mr. W. R. Hamilton, and it is his great-grandson, Admiral Sir William Goodenough, who now in 1930 succeeds to the presidency of the Society.

In those days of the thirties vast continents invited the explorer. To go to Australia one must board either a man-of-war or a convict ship. The Society awarded its Royal Premium to Lander in 1832 for his exploration of the Niger, and in 1833 to Biscoe for his circumnavigation of the Antarctic Continent. Charles Darwin came home in the *Beagle* in 1837 to stir the streams of modern thought.

The Society's Record by Dr. Mill

In Dr. Mill's volume "The Record of the Royal Geographical Society, 1830–1930," published for the celebration, one may find an epitome of the century's ongoing. Here in passing let it be observed that this volume, vividly written and amply illustrated, is a noble memorial. It gives a deep perspective and pays tribute to a long succession of distinguished men. Murchison was long a commanding spirit. He was a strong supporter of exploration, and the days of his supremacy were the heroic days of African exploration. He guided the Society's growing strength and saw it wax in numbers from its original 460 in Regent Street, until "he left it 2300 strong on the very threshold of the home of its mature strength, 1 Savile Row." His name is a symbol of the indissoluble union of human and physical geography.

For the early years meetings were held in the house of the Horticultural Society in Regent Street, in rooms whose bareness required some sacrifice by the fellows, who, as the price of attendance, must leave ample homes or palatial clubs. In 1841 the Society acquired a home in Waterloo Place, close to Pall Mall. The third home, entered in 1854, was in Whitehall Place and was the abode of the Society until 1871.

Then removal was made to 1 Savile Row, which became, to quote Mill, "For more than forty years . . . the Mecca of all true geographers, the home port of every traveller. . . . Here . . . hundreds of foreign geographers who had studied to discover and to comprehend the Earth resorted as to a shrine . . . the spirit of Geography must surely continue to haunt that corner."

This was the time of Sir Clements Markham's "mastery" and of the devoted secretaryships of Bates and Keltie. Sir Clements Markham served fifty years on the Council and was Honorary Secretary for twenty-five years, "he lived amongst two generations of men and ruled among the third." Many of us remember the gentle kindness and solid force of Dr. Keltie and his work in geographical education and as editor of the *Journal* and The Statesman's Year-Book. There is not space here to quote Dr. Mill's tribute to this beloved man.

One could not share in this celebration or meet the officers and fellows of the Society or read the pages of its history without recognizing the ties of interest and affection which join this group in close bonds. There is common pride in the past, joy in the present, and hope in the future, which make the new house, now brought to its full expansion, not a gathering place but a home.

The purchase of Lowther Lodge, the present home of the Society, was due to Lord Curzon, who, after his career as Viceroy of India, became President in 1911. With incredible energy he raised a large sum of money and bought the new home in Kensington Gore, "the outstanding triumph of Curzon's reign," Mill calls it. On the corner between Lowther Lodge and Exhibition Road the addition stands, and so skillfully has it been welded with the earlier house, that harmony and ample space and convenience have resulted. All the facilities of the building have been expanded, the library has been given light and spacious quarters, and an attractive ambulatory joins old and new. This feature is especially appropriate for social use, and its large and light wall spaces give room for the display of famous maps and other treasures. The most notable feature is the perfectly appointed hall. It seats nearly a thousand persons and, although on a busy corner, is as nearly sound-proof as possible.

Personalities of the Centenary

The personalities of the Centenary carry one far back in the life of the Society. First to be named is Mr. Douglas Freshfield, who has given more than sixty years to exploration and to creative service in the organization. He was inducted into membership in 1869 by Sir Roderick Murchison. Geographical education owes him a debt for being ever the sturdy protagonist for its advancement. Then there

is Sir Francis Younghusband, who forty years ago began his geographic career with a daring and lonely journey across the interior of Asia, an achievement which at twenty-four years of age won him the Founder's medal.

Colonel Sir Charles Close was just crowning his fruitful Presidency in the opening of the new building with the accomplishment of the Centenary celebration. India and Africa long claimed him for expert service, then the great war, and finally the Ordnance Survey, where he was Director-General for many years. And now the Presidency falls worthily upon Admiral Sir William Goodenough, to whom, with the retiring President, abundant honor was paid by the Prince of Wales in his address at the final dinner.

Dr. Hugh Robert Mill is known to every geographer for his researches and his writings and now as the author of the history of the Society which he has long served. Then there is the Marquess of Zetland, traveler, writer, distinguished colonial governor, who, as the Earl of Ronaldshay, was President of the Society in the years 1923–1925.

Other names belonging to the officers and staff are the Viscount Allenby, Brigadier General E. M. Jack, and Major General Sir Percy Cox. Mr. Arthur R. Hinks, the secretary of the Society, was called to this position in 1913, from his lectureship in astronomy and mathematical geography in Cambridge. His good cheer and careful planning were in evidence throughout the celebration. Mr. Edward Heawood, the accomplished librarian, and Mr. Edward A. Reeves, map curator and instructor, are well known for their geographical work.

The Meetings and Receptions

At the inaugural meeting on Tuesday afternoon in the new hall His Royal Highness the Duke of York presided. On the platform with him were Colonel Sir Charles Close, Sir Maurice de Bunsen, Brigadier General E. M. Jack, Dr. T. G. Longstaff, Lord Biddulph, Admiral Sir William Goodenough, and Mr. Arthur R. Hinks. The Duke of York declared the building open and made a short address of congratulation. A telegram from the Belgian King was read; and the delegates were then presented individually to the Duke of York, who received from them the addresses of sister societies. The addresses of the two societies senior to the London Society were read in full by Dr. J. B. Charcot and Professor Albrecht Penck, respectively. As was the custom after all sessions, refreshments were served in the ambulatory and in various rooms.

The Centenary meeting was held on Tuesday evening. This was introduced by the creation of honorary members and the conferring of diplomas carrying this honor.

Addresses followed, on the history of the Society, by Colonel Sir Charles Close, Dr. Hugh Robert Mill, Mr. Douglas Freshfield, Lieutenant Colonel Sir Francis Younghusband, and the Marquess of Zetland. We have already spoken of Mr. Freshfield's push for education. In his address he referred to Keltie's "irresistible report" and showed how the Society had coöperated with the universities, until now, when not only Oxford and Cambridge but all the other universities of the Kingdom have departments or schools of geography.

Space does not permit a report of these addresses, but in all of them the breadth of our subject appears. However much we may desire to make our science in some measure technical and exact, we must, even if to some it may seem discreditable, recognize its vast range. Sir Charles Close finished his address with these words, "After a century's experience we can say that one source of our strength is that we have no narrow, restricted view as to the qualifications of a geographer nor as to the content of our subject, which is no less wide than the study of the Earth itself, but particularly includes the study of the Earth as the home of man."

In the same vein, Lieutenant Colonel Sir Francis Younghusband, recounting his early explorations, said that some of the Council even in late days thought the climbing of Mt. Everest sensational. But Sir Francis said, "I held that there was not a square foot of the planet's surface to which Fellows of the Society should not at least try to go." And again, "I claimed that the description of the natural beauty of a region was just as much our business as the measurement of it for a map."

On Tuesday and Wednesday evenings respectively, the Geographical Club and the Kosmos Club entertained large groups of the delegates at dinner. At the former there were toasts to His Majesty the King and to the heads of states represented. At the latter several persons were called upon to speak. Among these were Mr. H. Stuart Hotchkiss, a Councilor of the American Geographical Society and one of its delegates, Professor Emmanuel de Margerie, Dr. T. G. Longstaff, and Professor Norbert Krebs.

Wednesday evening was given over to a reception at the house of the Society, at which the delegates and guests, said to number two thousand, were received in the hall by Sir Charles and Lady Close. Afterwards moving pictures were shown, with a lecture by Dr. Hamilton Rice on his expedition to the Uraricuera and Parima rivers.

Papers on the Habitable Globe and Incidents in the History of Exploration

The morning sessions of Wednesday and Thursday were devoted to scientific papers on the general theme of the Habitable Globe. The subjects on Wednesday were: The Alleged Desiccation of Central Asia, by Dr. Albrecht Penck; Palestine and the Stability of Climate in Historic Times, by Professor J. W. Gregory; and East Africa Past and Present, by Mr. L. B. S. Leakey. On Thursday morning the papers were: Population Pressure, by Professor A. M. Carr-Saunders; The Amount of Cultivable Land, by Professor C. B. Fawcett; The Conservation of Native Populations in New Guinea, by Mr. E. W. P. Chinnery, and The Habitability of the Kalahari, by Captain the Hon. B. E. H. Clifford.

A session of lively interest was held on Thursday afternoon. Five stories of the veterans of exploration cannot be reported in a paragraph; the subjects and speakers were: Muztagh Pass in 1887, by Sir Francis Younghusband; The First Expedition from Uganda to Ruwenzori, by Lord Lugard; The Andes Expedition in 1898, by Sir Martin Conway; Mt. Kenya in 1899, by Sir Halford Mackinder; and The *Endurance* in the Weddell Sea, by Mr. J. M. Wordie.

The Centenary Dinner

The Centenary dinner brought the festivities to a close on Thursday evening. It was given in the Connaught Rooms and was a brilliant consummation of the hundred years. His Royal Highness the Prince of Wales was in the chair and made an address upon the history and significance of the Society to a distinguished company of more than seven hundred guests. Addresses followed by Colonel Sir Charles Close, the retiring President, and by the incoming President, Admiral Sir William Goodenough. There were three addresses of response by foreign delegates: from France, by Dr. J. B. Charcot; from Germany, by Dr. Albrecht Penck; and, in the absence of the American Ambassador, by the writer, who brought the greetings of the American Geographical Society and of all American geographers.

The Centenary celebration was a memorable link between the past and the future. An institution administered by tried men of long experience, fully abreast of all the demands of modern geography, in its new home, the Royal Geographical Society begins its second hundred years.

GEOGRAPHY AT THE SECOND INTERNATIONAL CONGRESS OF SOIL SCIENCE

Charles F. Shaw

University of California

THE Second International Congress of Soil Science was held in Russia during July and August, 1930.[1] The sessions from July 20 to 26 inclusive were in Leningrad and from the 27th to the 31st inclusive in Moscow, followed by a twenty-four-day excursion through central and southeastern Russia. Twenty-six nations were represented by about 120 delegates exclusive of those from Russia; and of these foreign delegates sixty-seven participated in the long excursion.

The deliberations of the Congress included several general sessions, but most of the papers were presented in the meetings of the Commissions. These deal respectively with (1) Physics of Soils, (2) Chemistry of Soils, (3) Biology of Soils, (4) Fertility of Soils, (5) Classification, Mapping, and Morphology of Soils, (6) Management of Soils; the Sixth Commission has a Subcommission on Peat Soils. The Fifth Commission is of most interest to geographers and indeed seemed to be of interest to the greatest number of the delegates, both foreign and Russian.

Among the papers containing matter of more particular geographical interest were the discussion of the drainage and reclamation of portions of the Zuider Zee by Dr. D. J. Hissink (Holland) and the more general paper on the utilization of soil by Sir John Russell (England). The latter paper discussed the relation of soil characteristics and soil fertility to the kind and quality of crops that could be grown in the different climatic regions of the earth and the resultant conditions of occupation and use by man.

Soil Exhibits

The meetings in Leningrad and Moscow were broken by several one-day excursions to adjacent regions to study soil profiles and by periods set aside for the study of the exhibits of soil monoliths, maps, charts, and other illustrative material. These exhibits were most detailed, complete, and instructive and to the pedologist called insistently for more intensive study than the available time allowed. Monolithic sections of soils in boxes six to ten inches wide and from three to twenty feet in depth, showing the undisturbed structure, color, and other morphologic features of the soil, had been brought in from all parts of Russia. These were arranged by groups according to the Russian scheme of soil classification and illustrated in a most graphic way the soil conditions throughout that immense country. The soil columns were supplemented by specimens of native vegetation, by photographs, by mechanical and chemical analyses, by charts and graphs showing details of their characteristics, and by maps showing their geographic occurrence and distribution. The illustrative materials at Leningrad and Moscow covered the entire country and were most complete, but at nearly every institution visited on the long excursion similar exhibits of local soils had been prepared to illustrate the local conditions. When studied in connection with the soil profiles visited in the field, these exhibits served to give a well rounded picture of soil conditions in the whole country. Much credit is due to those whose vision and industry produced these really remarkable exhibits.

[1] On the First International Congress of Soil Science, which was held in Washington, D. C., in 1927, see Dr. C. F. Marbut's report in the *Geogr. Rev.*, Vol. 17, 1927, pp. 661–665.

Reports on Soil Mapping

In the Fifth Commission (Classification, Mapping, and Morphology) many papers were presented dealing with the pedologic and geographic features in various parts of the world, some with a general or regional discussion and many with purely local descriptions. The reports on the progress of soil cartography occupied several sessions. Dr. C. F. Marbut (U. S. A.) reporting for the Americas, announced the proximate publication of a general soil map of the United States on the scale of 40 miles to the inch, with supplemental maps on a small scale to illustrate more general features. This map is being published as a part of the Atlas of Agriculture. Progress is being made in mapping the soils of Porto Rico; but no maps will be published until the entire island is surveyed, about two years hence. No progress has been reported from South America, though interest in soil surveys has been expressed by Chile, Colombia, and Venezuela.

Dr. B. B. Polynov (U. S. S. R.) reported on the soil maps of Asia, presenting maps of parts of Manchuria and Mongolia and of Korea, Japan, and Kamchatka prepared by Russian and Japanese pedologists. He also presented several soil maps of Asiatic Russia (Siberia and Turkestan) and described the work now in progress in these regions. Most of these maps showed greater detail and accuracy than the map of Asiatic Russia published in 1927. A soil map of India, compiled by several English and Indian scientists, showed those soils in groups based on the Russian classification. C. F. Shaw (U. S. A.) presented a map and descriptions of the soils of eastern and central China, broadly classified in nine great groups, supplemented by a paper on the soils of Shansi Province by R. T. Moyer (China). Shaw points out the great extent of soils from alluvial deposits and the relative inextensive area of soils from eolian loess, while Moyer shows the actual extent and location of the deep loess areas in Shansi. North of a line drawn roughly along the Hwai River the agriculture of China is based on wheat and corn grown on neutral or calcareous soils, while south of that line rice culture on acidic soils is dominant. This line is also more or less an ethnological boundary and has also often been a line of political cleavage.

Dr. H. Stremme (Danzig) reported the progress made on the new soil map of Europe, showing a mosaic of manuscript maps with about sixty per cent completed. Much difficulty is being encountered in accumulating adequate data on central and western Europe. The completed portions cover Russia and Great Britain, with more or less yet to be compiled in the other countries. Dr. E. H. del Villar (Spain) presented a published report on Mediterranean soils studied in Spain. No reports were received from Africa or from Australasia.

The Excursions

The short excursions about Leningrad and Moscow illustrated the development of podsolic soils under cold temperate climates and forest cover, the natural vegetative cover being associations of birch, fir, aspen, and pine. The effect of differences in microrelief and particularly of differences in drainage on the characteristics developed in the soil profile were shown and discussed. Study was facilitated by the excavations of pits four to six feet deep and of length and breadth sufficient to admit from six to fifteen delegates. South of Moscow there was a change to an intermediate, rather "spotted" condition of forest-steppe country with podsolic soils in the forest areas and darker-colored soils in the grassland areas. The latter were without the lime accumulations characteristic of the chernozems of the true steppes and appeared to represent an intermediate or transitional condition.

Whereas the podsolic soils to the north were only partly in farms, with many areas of woods or forests and with oats, rye, and potatoes as the most obvious crops, this region is more generally in farms and is utilized for wheat or is in pasture. To the south the proportion of wooded land decreases and that of grassland dominates.

From Saratov on the Volga River to Rostov on the Don the excursion crossed the southeastern margin of the chernozems and the belt of chestnut-colored soils that borders it on the southern or more arid margin. In this belt of southern chernozems and chestnut soils the first great state grain farms are located. While this region is said to have an average rainfall of about eighteen inches, the variability is shown by the records of four years at a near-by station—1924, 12.32 inches; 1925, 26.56; 1926, 13.24; 1927, 18.84. As much of the summer precipitation falls as showers that merely wet the surface and soon evaporate, and as some of the winter snows are blown away, the effectiveness of the rainfall is reduced, and farming, even by modern methods, appears precarious. It is significant that this country in the past has been utilized as broad-range pastures with little raising of grain or other crops.

At the foot of the north slope of the Caucasus Mountains, north of Mt. Elburz (18,470 feet), the excursion spent two days for rest and study of geological features, and thence proceeded to Vladikavkaz and across the mountains by the Georgian Military Highway just east of Mt. Kazbek (16,540 feet). On this passage the change from semiarid steppe through the forested zone to the subalpine meadows was observable, and profiles in the latter zone were studied. The utilization of these subalpine grasslands was a striking feature of the landscape, as the grass was then being cut and the hay was in the swarth or the stack on these exceedingly steep meadows.

At Tiflis the excursion temporarily separated into three parts to visit the oil fields and arid soils at Baku, to visit Erivan in Armenia, and to study the soils in the forested mountains at Bakurani. In these mountains were encountered the only soil profiles that resembled the "Braunerde" of southern Germany described by Ramann. Here too was observed the succession of soils at different elevations, the "vertical zone" distribution often discussed by the Russian pedologists.

Near Batum the red soils that are developed under the humid subtropic climate were observed. They were described as being lateritic in character and precipitated vigorous discussion by the pedologists from tropical regions having lateritic soils. It was considered significant that these red soils were derived from parent material of basic igneous origin. Upon these soils are located the tea plantations of Russia, and at Chakva is the government tea experiment station. It is proposed to extend production in this region to the utmost and so develop a domestic supply for the whole country.

On the south slope of the Yaila Mountains near Yalta (Crimea) semiarid reddish soils were studied; but their extent, and the degree of erosion on the steep slopes, made the profiles of problematic value.

True chernozems were studied in detail at Kharkov and at Kiev, with deep pits and excellent exposures. Here, as elsewhere in the chernozem zone, were the buried soil horizons so characteristic of this loessial region, with the "fossil" burrows of rodents and worms as striking features. Here are located the wheat-breeding stations that are expected to develop more productive new varieties.

The Congress was highly successful, particularly for those who took the full excursion. The foundation upon which the Russian school of soil science is based is better understood, and the usefulness to the rest of the world of the schemes of soil classification and their supporting theories can be better evaluated. Much credit must be extended to the General Organization Committee headed by Dr. Yarilov and Dr. Vilensky for the arrangements that were made to enlighten and entertain the delegates.

At the last plenary session in Moscow the meeting of the Third International Congress of Soil Science was set for 1935 in England; and Sir John Russell (England) was elected president, Dr. D. J. Hissink (Holland) general secretary, and Dr. C. F. Marbut (U. S. A.) and Dr. A. A. Yarilov (U. S. S. R.) vice-presidents.

AMERICAN GEOGRAPHICAL SOCIETY

The November Meeting and Presentation of the David Livingstone Centenary Medal for 1930 to Laurence M. Gould. The first regular meeting of the American Geographical Society for the season 1930–1931 was held on November 25, 1930, at the Engineering Societies' Building, 29 West 39th Street, President John H. Finley in the chair. After calling the meeting to order Dr. Finley presented the David Livingstone Centenary Medal for 1930 to Dr. Laurence M. Gould of the University of Michigan for his explorations in the Antarctic as geologist and geographer of the Byrd Antarctic Expedition, 1928–1930. In reviewing Dr. Gould's professional career, which also includes some notable work in the Arctic—in Greenland (1926) and Baffin Island (1927)—Dr. Finley referred especially to the qualities of leadership and organizing power and to the high opinion which his associates have always held of Dr. Gould's character and ability.

Dr. Gould then addressed the Society on his Antarctic field work. During the expedition he made two independent trips, one by airplane, to the newly discovered Rockefeller Mountains, 150 miles east of Little America, and the other by dog sledge 440 miles south from Little America to the mountains at the border of the South Polar Plateau. Of these border mountains, for a distance of 250 miles, the first adequate survey was made. Aside from its scientific results Dr. Gould's sledge journey was in the highest tradition with respect to organization, distance covered, and successful completion of a predetermined program. A full account of his explorations will appear in a forthcoming number of the *Geographical Review*.

At the meeting there were presented with the approval of the Council the names of 476 candidates, who were duly elected as Fellows of the Society.

Presentation of the David Livingstone Centenary Medal for 1930 to José M. Sobral. The presentation of the David Livingstone Centenary Medal for 1930 to Dr. José M. Sobral took place on August 8, 1930, at the American Embassy, Buenos Aires, at a ceremony arranged by His Excellency the American Ambassador, Robert Woods Bliss. In presenting the medal Ambassador Bliss spoke in part as follows:

"At the request of the American Geographical Society of New York, and with the authorization of my Government, I have this morning the great pleasure of presenting to one of your countrymen the David Livingstone Centenary Medal, established in 1913 by the Hispanic Society of America on the occasion of the 100th anniversary of the birth of David Livingstone and awarded by the American Geographical Society for scientific achievement in the field of geography of the southern hemisphere. . . .

"This compatriot of yours, the Director-General de Minas, Geología e Hidrología en el Ministerio de Agricultura, completed about ten years ago the reorganization of this Bureau, engaged a personnel of German and Swedish geologists and topographers, and initiated a program of mapping and geographical and geological studies in the Argentine section of the Cordillera of the Andes. He has fostered these studies outside his Bureau, as well as conducting them within, with the result that the mapping of a large part of the Argentine Andes has now been completed.

"The results have been published in a series of books, brochures, and maps, the publication of which has been kept well apace with the completion of each piece of work. The methods of survey which Doctor Sobral has pursued in this work are of particular importance: he employs a rapid reconnaissance type of survey based on a

good triangulation and as a result has covered at a minimum cost a large area with topographic maps which satisfy completely all present needs. The Geographical Society is informed that his is the only bureau of its kind in Hispanic America that has been continuously engaged on a well planned program for a considerable period of years.

"That the labor and competency of an Argentine scientist should be selected for recognition in the manner of which you gentlemen are witnesses this morning is a source of gratification to those who see the happy relations that mark the cultural intercourse between our two countries and is moreover an evidence of the high appreciation in which the scientific men in Argentina are held by their confreres in the United States.

"In expressing to you, Doctor Sobral, my felicitations for an honor you so highly deserve, it is my privilege to present to you this gold medal, the high distinction which the American Geographical Society of New York has awarded you in recognition of your eminent services. May this simple ceremony be an added inspiration to the men of our two republics to increase the common effort for the advance of science and the realization of the high ideals which guide our leaders."

In responding Dr. Sobral spoke of the "special significance" of the distinction, "coming from our great Sister Republic." He referred to the part played in the development of the great resources of the United States by geographers, geologists, and engineers, and touched on some interesting phases of work in progress in Argentina.

"The mapping of our country has been made by several institutions, and the work accomplished by this Bureau belongs to its officers, to whom I am in debt for their hearty collaboration. In the execution of the topographical maps I have had no personal part excepting the selection of place and the opportunity and kind of work. For these reasons I accept this beautiful medal as an honor to the Dirección General de Minas, Geología e Hidrología.

"At present we are prosecuting topographical and geological research especially in the less known parts of our country, as for instance Tierra del Fuego. We are also sounding our Andean lakes. In Lake Nahuel Huapi, the first to be investigated, relatively great depths have been found—as great as 450 meters.

"I am very happy to receive this medal from the hands of His Excellency, Ambassador Bliss. I know Ambassador Bliss through my old friend the eminent Swedish geologist, Professor Gerard De Geer. Professor De Geer has founded a geochronological institution in Stockholm. There many of his pupils make investigations on the so-called varved clays. The American Geographical Society has published studies on varved clays in North America and on glaciological investigations in general by one of De Geer's pupils [Antevs].

"Here our Dirección de Minas, Geología e Hidrología has been investigating Quaternary glaciation in the southern territories. One of our geologists, a Swede, has found varved clays in the basins of nearly all our Andean lakes. The results of this work, the accomplishment of which has taken several years, show among other things the probability of contemporary glaciation in the northern and southern hemispheres. . . .

"I beg Your Excellency to thank the American Geographical Society for this extraordinary distinction and accept, Sir, the expressions of my sincere and hearty gratitude."

Shippee-Johnson Peruvian Expedition. The Shippee-Johnson Peruvian Expedition sailed from New York on December 6 to carry out, with the endorsement of the American Geographical Society, a program of aerial mapping in various parts of Peru. The expedition is equipped with two Bellanca cabin monoplanes one of which will be used for photographic work and the other for transporting supplies. The photographic plane, in addition to being equipped with the most recent and

efficient of photographic apparatus, has a supercharged 300-horse-power motor which will make it possible to rise to altitudes up to 28,000 feet for photographic work in the Maritime Cordillera of the Andes.

The primary purpose of the expedition is to map from the air and study and photograph on the ground the little-known agricultural communities on the floor of the deep gorge of the Colca River some seventy miles north of Arequipa. The Chimú Valley, the site of Chan-Chan, the capital of the kingdom of the Great Chimú, whom the Inca conquered shortly before the Spanish conquest, will also be photographed from the air, and an attempt will be made to discover whether aerial mapping in the heavily forested eastern valleys of the Andes and the Amazon lowland is feasible.

Lieutenant George R. Johnson, co-leader and photographer of the expedition, is the author of "Peru from the Air" (see below).

Recent Publications

Brief History of Polar Exploration Since the Introduction of Flying. In response to the great interest shown in the Society's Special Publication No. 11, "Brief History of Polar Exploration Since the Introduction of Flying," by W. L. G. Joerg, to accompany a Physical Map of the Arctic and a Bathymetric Map of the Antarctic, a second, revised, edition has been issued. The text has been practically doubled in length. The reports on the four Antarctic expeditions in the field in 1929–1930—those of Wilkins, Byrd, Riiser-Larsen, and Mawson—are completed and their routes shown on a text map, scale 1:58,000,000. A new section, "Flying in the Arctic for Practical Purposes," has been added (pp. 42–53). It takes account of the expeditions and flights for the establishment of a transatlantic air route by way of Greenland and of flying as an aid in the maintenance of sea routes in the Arctic. The latter refers to the exploratory work carried out in Hudson Bay pending the opening of the Hudson Bay Railway and the patrols of the Kara Sea and Siberian Sea. The special use of the airplane for mineral prospecting in Arctic Canada is noted, together with the recent flight of Major L. T. Burwash to map photographically the magnetic pole area and to seek further evidence of the Franklin Expedition of 1845–1848. Some of the important non-flying expeditions in the Arctic since 1925 are also cited.

The section on political rights in the Arctic and Antarctic has been amplified. The steps taken by Russia in pursuance of her declaration of sovereignty over Fridtjof Nansen Land (Franz Josef Land) and over Wrangel Island are described, and the status of United States claims in the Antarctic is brought up to date. It is pointed out that the peculiar physical conditions in the Polar Regions and the problems arising from the new possibilities of transportation in these regions—aircraft and undersea craft—place new problems before the formulators of international law.

Peru from the Air. The Society announces the publication under this title of a remarkable set of 142 aerial photographs of Peru taken by Lieutenant George R. Johnson, an American specialist in aerial photography, while serving as Chief Photographer of the Peruvian Naval Air Service during 1928 and 1929. The photographs were chosen from a collection of several hundred and so selected and arranged as to present a representative cross section of the topography of Peru and the life of its people. They have been reproduced as full-page illustrations 8½ by 6½ inches in size and are fully described by legends and notes and accompanied by an introductory article by Raye R. Platt on the landscape of Peru illustrated with numerous maps and sketches.

GEOGRAPHICAL RECORD

NORTH AMERICA

Northern Alaska. In 1923, when 35,000 square miles in the northwestern portion of Alaska were set aside as Naval Petroleum Reserve No. 4, the known oil resources were confined to several seeps along the coast. Investigations as to the actual extent of the oil reserves and the possibilities of exploitation were therefore undertaken by the U. S. Geological Survey. The results are summarized by Philip S. Smith and J. B. Mertie, Jr., in "Geology and Mineral Resources of Northwestern Alaska" (*U. S. Geol. Survey Bull. 815*, 1930). Prospects for any immediate oil production are very slight. In reconnaissance surveys covering thousands of miles no new evidences of petroleum have been found. Examination of previously reported sources has left Cape Simpson as the site of the only actual oil seepage. However, a strongly indicated source of the oil is oil shale probably of Lower Cretaceous origin—a series which is likely to be widespread though deeply buried (compare also J. B. Mertie, Jr., "Mountain Building in Alaska," in the August, 1930, number of the *Amer. Journ. of Sci.*, pp. 101–124).

The authors point out that, even were oil to be discovered, exploitation would be dependent in high degree upon the geographic limitations of the region. For the most part it lies within the Arctic Coast climatic province, so designated by Miss Edith M. Fitton in her recent study of "The Climates of Alaska" (*Monthly Weather Rev.*, March, 1930, pp. 85–103). The navigation season is of but two months' duration, storms and fog are common, and ice action along the shores is so vigorous as to preclude the erection of the permanent wharves which would be required, since the sea is too shallow to allow the landward approach of any but the smallest vessels. On shore, the soggy condition of the ground forbids the use of wheeled vehicles during the summer, and the scanty vegetation can provide neither feed for horses nor wood for construction or fuel purposes. The area produces no food supplies but wild meat and reindeer. Coal is widely distributed, but there are no transportation facilities. There is no local labor supply, for there are probably less than 200 white men in the whole district, and the several thousand natives—Eskimos on the coast, Indians in the interior—are unused to routine labor.

The Chandalar-Sheenjek District, which practically adjoins the Petroleum Reserve on the southeast and extends from Brooks Range south to the Yukon, has also been examined by J. B. Mertie, Jr., in "Mineral Resources of Alaska 1927" (*U. S. Geol. Survey Bull. 810*, 1930). Here, where the older rocks outcrop, gold is the important mineral. In general, however, conditions are not favorable to the occurrence of rich placer deposits, and the area is too remote for lode mining; although the airplane, which has proved very successful in small operations, may become a factor in making the region more accessible. Incorporated in both this report and the preceding one are sketch maps which, in showing the distribution of timber in these two districts, provide detailed information as to the northern limit of tree growth in Alaska.

Still farther to the east the Eagle-Circle District, part of the great central plateau between the Alaska Range and the Brooks Range, is well known for its gold placers (*U. S. Geol. Survey Bull. 816*, 1930). At present, although the area has only about eighteen inches of rainfall, hydraulic mining is being successfully employed. The Fortymile District, which lies south of Eagle along the International Boundary, is the oldest mining district in interior Alaska, having begun production in 1886

(*U. S. Geol. Survey Bull. 813-C*, 1930). Here again remoteness has made lode mining impracticable, but an airplane landing field is facilitating the work of the prospectors.

Topographic Map of North Central Oregon. A topographic map of north central Oregon, based chiefly on original surveys by Professor Edwin T. Hodge but including parts of three U. S. Geological Survey maps in its northeastern fifth, has lately been published, in three colors on a scale of four miles to an inch with 100-foot contours, by the University of Oregon at Eugene in its Geology Series (Vol. 4, No. 1) on a sheet measuring 18⅜ by 31⅞ inches. It covers an area of over 7000 square miles lying next east of the Cascade Mountains and drained northward to Columbia River by the Deschutes and John Day rivers. An explanatory text is printed on the back of the sheet, in which an epitome is presented of Hodge's geological studies, later to appear on a colored edition of the map with appropriate text. It thus appears that the Columbia River lavas of Miocene date, which have hitherto been supposed to cover all the region of the map, have been eroded from certain areas of upheaval, where patches of a pre-Cascade mountain system are exposed with northwest-southeast trends. One of these patches is the hard-rock core, known as Mutton Mountain (2500–3000 feet altitude), of an unroofed anticline in the Columbia basalts that extends eastward from the base of the Cascades beyond Deschutes River. The gently dipping northern flank of this anticline slants twenty miles to Tygh Ridge, which is described as a faulted flexure of the Columbia basalts, trending east-west, with a crest 3000 feet in altitude, a bold face descending 1500 or 2000 feet to the south, and a gentle northern slope of twenty-five miles to the Columbia River, but in which no older formations are laid bare. The mighty Columbia itself appears to flow along the northern border of the mapped area in a structural depression, where a gentle northern slope of its vast lava field meets a steep, south-facing bluff from 1500 to 2000 feet high—apparently a modified fault scarp—on the Washington side of the river; the gentle northward slope being repeated beyond the crest of the scarp. This clearly suggests that, for some fifty or sixty miles upstream from its fine gorge through the Cascade Mountains, the river must be consequent upon the longitudinal fault trough, near the floor angle of which the powerful stream has cut a trench of moderate depth and has as a rule developed a graded course; but shortly before the end of the trench is reached the channel is subdivided by many small lava-bed islands, among which the current is repeatedly interrupted by low falls and rapids. The lava islands resemble gigantic flagstones, whence their name, the Dalles, given by early French *voyageurs;* hence also the name, The Dalles, the chief city of eastern Oregon, just below the rapids.

W. M. Davis

Physiographical Study in the Salton Basin Region. The comprehensive plan of study of the Tertiary and Pleistocene of the Pacific Region, initiated by Dr. John C. Merriam and supported by the Carnegie Institution of Washington, is beginning to bear fruit. John P. Buwalda and W. Layton Stanton present preliminary results of their study of the Indio Hills within the Salton Basin in a short paper in *Science* (Jan. 24, 1930, pp. 104–106). The hills consist of folded, partly consolidated beds partly marine and partly subaerial. The marine beds are correlated with the Carrizo formation, which is thought to be of upper Miocene or lower Pliocene age. The overlying subaerial beds, Indio formation, were formed in a desert basin like the present. Both series have been folded, beveled by erosion, and uplifted. Part of the uplift is associated with movement on the San Andreas rift.

With this chronological background the authors consider the question of the recent occupancy of the depression by an extension of the Gulf of California. On the ground that the only marine beds in the basin are the Carrizo formation of Tertiary age and the evidence that this incursion of the sea was followed by subaerial deposi-

tion (Indio formation), by folding, faulting, and erosion, they hold that the depression of the basin below sea level and the building of the delta of the Colorado River were contemporaneous. Terraces of a recent fresh-water lake are conspicuous. The salt of the basin appears to be due to the evaporation of water from the Colorado River. Evidence of recent movements exists in very youthful fault scarps. These are supplementary and confirmatory evidences. That the Colorado River should maintain a cone now only 30 feet above sea level at its lowest point and yet high enough to exclude the sea through this long period may seem remarkable. But the authors cite the size of the stream, its heavy burden of sediment, and the 125-mile extension of the delta into the Gulf. The authors do not take into consideration that the present silt content of the Colorado River is excessive and is probably due to the initiation of the Recent epicycle of erosion. In the past the rate of upbuilding of the delta may have been smaller. The clays and sands below the delta and below the basin are only imperfectly known from well records. It seems possible that short incursions of the sea may have been overlooked, but the general argument is sound; and it appears that the authors have demolished another scientific fancy which rested on inadequate knowledge of the facts.

KIRK BRYAN

EUROPE

Alpine Economy in a Valley of the Caucasus. The study of Alpine economy, "Mountainous Ingushiya," by Viktor P. Khristianovich (Gornaya Ingushiya: K Materialam po Ekonomike Alpiiskogo Landshafta, Rostov, 1928) possesses an interest transcending the limits of the tiny segment of Caucasian valley with which it deals. It is a substantial contribution to the meager literature of a subject regarding which important generalizations remain to be worked out once a sufficient body of materials from various sources has been assembled. The way to some such generalizations is pointed by the existence, despite remoteness and differences in culture, of striking similarities between fundamental concepts of the economic functions of the landscape in the Caucasus and in the European Alps, according to studies of the latter by F. Briot, *Les Alpes françaises* (Paris, 1907), and Josef Spann, *Alpwirtschaft* (Munich, 1923). The most basic of these concepts is the division of the exploitable slopes by altitude into three main zones according to the uses to which they are adapted: the "beinezh," corresponding to the Central European "Sennalpen" or "montagnes laitières"; the "rem-lam," corresponding to "Galtalpen"; and the "tarkh-lam," corresponding to "Schafalpen." Incidentally, it may be remarked that possession of the common linguistic root "alp-alm-lam" to designate a mountain-side pasture suggests the possible existence of a common traditional experience underlying the present separation and differences. The rule of an old Ingushian cowherd, that the highest limit for profitable summer pasturage of milch cows is that within which 100 days of grazing results in an average production of one pood of butter, works out in almost exact correspondence with the Savoyard rule, stated by Briot, of 5 liters of milk per day.

Mr. Khristianovich's study is based on an expedition of inquiry and on elaborate budgets for 21 households, embracing different localities, conditions, and degrees of prosperity, compiled in connection with it. The synthesis of figures shows sheep raising to be the most profitable activity of the population; but the description of general conditions in the region and of those affecting dairying in particular indicates that the advantage here is largely due to local causes. Lack of capital and of managing and technical direction, paucity of ways of communication within the mountains and with the surrounding country, and remoteness from any large consuming populations render any such highly organized development as that of the valley-bottom cheese industry of Switzerland out of the question.

Much can profitably be done by public work, intelligent organization, and

improvement of methods to develop the resources of a mountain region and raise the standards of its inhabitants; and such studies as this should provide guidance for the direction of endeavors to this end. Nevertheless, the recent depopulation of mountainous Ingushiya by emigration to the plains of the Terek, after these were opened to settlement by the recent evacuation of the Cossack posts, offers a striking demonstration of the relative unattractiveness of Alpine life in the absence of special factors favoring it, such as insecurity or pressure of population in the lowlands. Access to summer pasturage in the mountains for their cattle and sheep remains a valuable advantage for the plain dwellers, and most of the emigrants retain their rights to this in their former communities; while access to winter pasturage in the plains appears from the mountaineers' budgets to be a deciding factor in showing a profit on their operations.

J. V. FULLER

The Early Settlement of Iceland. Before the coming of the Norsemen "Iceland was covered with forests between mountains and seashore. Then Christian men whom the Norsemen call Popes were here; but afterwards they went away, because they did not wish to live here together with heathen men, and they left behind Irish books, bells, and crooks. From this could be seen that they were Irishmen.

"And then a very great emigration started out hither from Norway until King Harald forbade it, because he thought that the country would be laid waste."

These words appear in the first chapter of "The Book of the Icelanders (Íslendingabók)" of Ari Thorgilsson (1067 or 1068–1148), of which Dr. Halldór Hermannsson has recently published a new edition, with English translation, introductory essay, and notes (*Islandica*, Vol. 20, Cornell University Library, Ithaca, N. Y., 1930). Hitherto the only English version of this brief but important account of the early settlement of Iceland and of the beginnings of the Althing (or parliament), the introduction of Christianity, and the work of the early bishops has been in the *Origines Islandicae* of Gudbrand Vigfusson and F. York Powell (2 vols., Oxford, 1905). It is fitting that a new edition should appear in 1930, the millenary of the establishment of the Icelandic parliament.

Dr. Hermannsson in his introduction endeavors to estimate the magnitude of the migration, which gave so much concern to King Harald. He warns us, however, that the data upon which such estimates are based are unsatisfactory. The *Landnámabók* lists the names of the principal settlers. If we assume that a large proportion of these came in their own ships and that each ship carried thirty or forty persons, and then double the total thus obtained to allow for the circumstance that probably less than half of the settlers are listed and that each ship must have made more than one voyage, we get about 20,000 for the number of people brought to Iceland during the sixty years before 930. There is also a record that in 965 each franklin contributed a tax equivalent to three silver pennies, from which a cloak pin was made that weighed fifty marks and was given as a reward to the poet Eyvind Finnsson. From this it has been computed that there were 3500 tax-paying franklins, and therefore about 60,000 inhabitants, in 965. All in all, Dr. Hermannsson concludes that the population may have been somewhere near 40,000 to 45,000 in 930. Whatever the precise figures, the migration was by no means inconsiderable, and "King Harald's alarm was justified, especially if, as estimated, the population of Norway" at the time did not exceed two or three hundred thousand.

The main cause for the exodus, according to Dr. Hermannsson, is to be sought less in "economic conditions, spirit of adventure, restiveness, lust of gain and the like," than in the "dissatisfaction of the old Norwegian aristocracy with" the new régime of King Harald Fairhair, "or his tyranny, as it was generally styled." Most of the settlers came from the west coast of Norway; a few from the south, the interior, and from Sweden. Possibly 5000 of the population of 930 were "derived from the

British Isles." These were for the most part Norwegians who had lived for a while in Ireland, Scotland, the Orkneys, or Hebrides, where they had married and whence they brought their families to Iceland. To what extent Celtic blood, through this channel, may have been introduced into the veins of the Icelanders and to what extent the markedly intellectual interests and abilities of Icelandic people may be ascribed to these southern contacts are questions about which Dr. Hermannsson refrains from pronouncing a definite opinion.

The Influence of Weather on Cereal Yields in Sweden. A careful study of the significance of the weather in cereal yields in Sweden is given by Fredrik Enquist in a paper entitled: "Studies of Contemporary Changes in Climate and Vegetation" (Studier över samtidiga växlingar i klimat och växtlighet, *Svensk Geografisk Årsbok*, 1929, pp. 7–50). The investigations summarized are founded, as regards the meteorological data, upon *duration* values of extreme temperatures. Through working with duration values instead of mean temperatures during continuous periods of time (days and months) the author has brought into play not only a variable *temperature* factor, as is usually the case, but also a variable *time* factor.

The author's basic thesis is that limits of species growth depend, as far as temperature is concerned, upon the duration periods of maximum and minimum temperatures. The argument is supported by many graphs, maps, and statistical tables based on meteorological records. Among the more definite relationships claimed to be proved are the following:

A decided change in climatic conditions of southern Sweden has been in progress since 1915. During the preceding decades the tendency was in the direction of increased maritimity; since 1915 the trend has been reversed.

In Sweden annual variations of crops prove to be due to variations in the duration of extreme temperatures. Comparatively cold summers are distinctly unfavorable to the crops of oats in northernmost Sweden, whereas relatively cool summers in southern Sweden have been favorable to oat crops. Winters of continental type are consistently followed by meager winter-wheat crops, whereas winters of maritime type are followed by excellent wheat crops. Temperature conditions of summer seem to have but little effect on the wheat crops.

In maritime regions, where the summers are comparatively cool and the winters relatively short, the cold limits are determined by the summer climate. In continental regions, however, where the summer temperature may be sufficiently high and of fair duration while the winters are too long, the winter climate is the decisive factor. The duration of the maximum as well as the minimum temperatures may be decisive.

As regards the heat limits, the summer climate is decisive in continental and the winter climate in maritime regions. The cold limits for the cultivation of barley depend upon the fact that the maximum temperatures of at least fifty-five days exceeds 12° C. Analogous figures for oats are fifty-five days and 16° C.

In continental Europe winter-wheat cultivation is not successful where the minimum temperature drops below 0° C. during more than 195 days of the year.

NELS A. BENGTSON

AFRICA

Algeria 1830–1930. Perhaps no better conception of the changes wrought in Algeria by a century of French occupation can be obtained than by examining a recent aerial photograph of Algiers. The Turkish and French sections are easily distinguished—the former small with narrow, irregular streets and crowded dwellings; the latter stretching along the water front and up the hillsides and characterized by large buildings and wide streets. As Professor E. F. Gautier describes the scene

in "Un siècle de colonisation, études au microscope" (Collection du centenaire de l'Algérie, Paris, 1930), the Turkish section appears as "an old cadaver encrusted with a new living growth." Nowhere is this more evident than in the harbor, for the early port was relatively small in comparison with the conspicuous part it played in history. The new port is very commodious, providing space for the native fishing vessels (in 1830 there was neither a fisherman nor a fishing vessel to be found along the entire coast) and for modern docks for the handling of wine, vegetables, alfalfa, hides, and sheep. At the far end the bulky minerals, especially iron, phosphates, and imported coal, are effectively handled by huge cranes. In his new book Professor Gautier has confined himself to specific instances rather than to a general survey. Thus, we acquire an intimate picture of Boufarik, one of the towns of the Mitija (*Geogr. Rev.*, Vol. 20, 1930, p. 158); and the story of the ostriches of the Algerian "steppe" illustrates the need for conservation and development of native animal life.

It was particularly fitting that this year's Congress on Rural Colonization should have met in Algiers and have devoted its time to the Algerian scene. Among the illustrative material prepared by the Direction de l'Agriculture de l'Algérie for this gathering is a map showing the areas settled during the periods 1830–1870; 1871–1895; 1896–1918; and 1919–1930. This map, together with a report of the proceedings of the Congress, is printed in *Renseignements Coloniaux* (*Supplément à L'Afrique Française*), September, 1930, pp. 513–539.

The history of French Algiers makes a striking story as told by Victor Piquet in "L'Algérie française, un siècle de colonisation, 1830–1930" (Paris, 1930). One of the interesting phases of this history has been the adaptation of French law to the needs of a country inhabited by another people and exhibiting an entirely different stage of economic development. This adaptation is essential because administratively Algeria is French and not colonial territory.

ASIA

Glaciation on the Roof of the World: Notes on Recent Exploration in the Pamirs and Karakoram. This is a day of international coöperation in exploration. An outstanding example is the Alai-Pamir Expedition which was led by Willi Rickmer Rickmers and consisted of eleven Russians and eleven Germans. Although the party worked only in the Pamirs, chiefly to the west of Kara-Kul, the project was first named the Alai Expedition in order to divert attention from a region of political sensitiveness. The name Alai-Pamir was not given until the return to Europe. The party, which spent five months in the field in 1928, was primarily concerned with surveying, and 4000 square miles were mapped by Finsterwalder and his associates. Stereophotography was used extensively, and six hundred good negatives were obtained.

Practically all of the ranges of the Alai Pamirs trend east and west except the Seltau, which extends nearly north and south. This exception is thought to be due to a major fault, evidence of which is seen along the western side of the range where ice falls, sometimes 3000 feet high, were found at nearly all of the glaciers. The Seltau Range was found to contain the highest peak in the entire Soviet Union, Mt. Garbo, with an elevation of 7500 meters. The former Mt. Kaufmann in the Trans-Alai Range with a corrected height of 7130 meters was thought at first to be the highest and was thus renamed Mt. Lenin. The most interesting discovery of the expedition was the finding of the longest glacier in the world outside the polar regions. This great ice stream, which has a length of 48 miles, was named the Fedchenko Glacier. It is located just to the east of and parallel with the crest of the Seltau. Its closest rivals are the Siachen Glacier (45 miles) and the Hispar Glacier (38 miles), in the Karakoram, and the Inylchek Glacier in the Tien Shan.

The glaciers of Turkestan are peculiar in that many of them lie in deep narrow valleys with precipitous walls that continue even around their upper ends. Such glaciers have no upper snow basins or nevé fields but are fed by ice falls and ice slopes and thus resemble a river below a waterfall. The glaciers are relatively flat, and their movement is slight, so that the lower ends are covered with rubble and protected from melting. In some cases the lower reaches of dead ice, left stranded by the last retreat of the glacier, extend upwards for miles before the live glacier is reached. Rickmers writes of the region as one of violent climatic contrasts where "glaciers dig their cool snouts into grey rocks blistering with the heat," and where "the heat deserts of the lowlands sharply dovetail into the cold deserts of the highlands." No correlation has yet been made between the times of ice advance or retreat and those recognized in the Alps.

The leader has given a short account of the expedition in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1929 (pp. 161–174), and in the *Geographical Journal* for September, 1929 (pp. 209–231), he relates it to his expedition of 1913. In "Alai! Alai!" (Leipzig, 1930) he gives excerpts from his diary and notes by other members of the party together with a discussion of the "Twostreamland" of Turan between the Amu Darya (Oxus) and the Syr Darya (Yaxartes). He also describes his ascent of Black Forest Mountain, Pamirs, in the *Alpine Journal* for November, 1929 (pp. 261–277). Articles treating the specific peaks and glaciers have been contributed by various members of the expedition to the *Zeitschrift des Deutschen und Österreichischen Alpenvereins* for 1929 (pp. 59–160). A preliminary report "Die Alai-(Pamir-) Expedition, 1928" has been published by the Notgemeinschaft der Deutschen Wissenschaft (1929).

Another expedition to visit the Pamirs was that of Edvige Toeplitz Mrozowska and Professor Giuseppe Capra of the University of Rome, known as the Toeplitz Expedition of 1929. They treked on the south side of the Alichur Pamir, and a description of the country along their route is given by Madam Mrozowska in the *Bollettino della Reale Società Geografica Italiana* for April, 1930 (pp. 251–269).

The Karakoram are described by Major Mason of the Survey of India as the "whitest, iciest range outside polar regions." Much confusion has arisen over the use of the name "Karakoram" (black gravel), which, originally applied only to the famous pass, is also used for the range of mountains, which Mason has demonstrated does not include the pass at all. Mason proposes that the name Karakoram-Himalaya be used for the entire mountain region between the Indus and the Tarim basins, including both the "black gravel" regions to the north and the "abode of snow" to the south. For the various ranges he would use new names such as "Muztagh Karakoram," for the system which includes K_2 and the other great peaks, and "Aghil Karakoram" for the range crossed by the Karakoram Pass. This suggestion has started a lively discussion.

In 1926 Major Kenneth Mason with the aid of three officers of the Indian Army and an excellent Indian surveyor explored the unknown Shaksgam Valley. The party entered the upper end of the valley but were prevented from continuing down it by the Kyagar Glacier. This glacier comes out from a tributary valley and presses its snout hard against the opposite wall, damming up a glacial lake five miles long. The surface of the glacier is totally impassable, for it is formed of a vast series of ice pinnacles rising 200 and 300 feet high over an area two miles wide and at least five miles long. No such pinnacles are known south of the Muztagh Karakoram Range, but similar surfaces with spires 50–60 feet high were recorded by Rickmers in the Seltau to the northwest of the Karakoram (Kenneth Mason: The Shaksgam Valley and Aghil Range, *Geogr. Journ.*, Vol. 69, 1927, pp. 289–332).

The final report, invaluable for its description of travel in this inhospitable area, was published by the Survey of India in 1928 (*Records of the Survey of India*, Vol. 22) and contains sections on geology, animal life, flora, meteorology, and appendices on

rations and supplies, equipment, transport, and names. Especially noteworthy are the accounts of photographic surveying. With a Wild phototheodolite and a Wild autograph Major Mason was able to draw 250-foot contours on K_2, the second highest peak in the world (28,250 feet), at a distance of 42 miles. In several cases it was possible to map areas out of sight of the naked eye (see Kenneth Mason: The Stereographic Survey of the Shaksgam, *Geogr. Journ.*, Vol. 70, 1927, pp. 342–358). Nothing approaching the accuracy and scale of Mason's use of photosurveying has heretofore been accomplished.

Thirty-four of "The Glaciers of the Karakoram and Neighbourhood" are described by Major Mason in the *Records of the Survey of India* (Vol. 63, 1930, pp. 214–278). A useful complement is his discussion of "The Representation of Glaciated Regions on Maps of the Survey of India" in *Survey of India Professional Paper No. 25*, 1929.

The Duke of Spoleto, also a recent visitor to the Karakoram, relates his experiences in the *Bollettino della Reale Società Geografica Italiana* for January, 1930 (pp. 3–20). Ardito Desio, a member of his party, gives a detailed itinerary in the March and April numbers of the same journal (pp. 163–181 and 277–300). Following a preliminary expedition in 1928, when supplies were stored near the snout of the Baltoro Glacier, three sections left Srinagar late in March, 1929. One group succeeded in filling in the last remaining gap in the exploration of the Shaksgam Valley. By crossing the Muztagh Pass they reached Shaksgam River and followed it up to the Kyagar Glacier, which had blocked Major Mason in 1926 and still completely filled the valley. Another party ascended the Baltoro Glacier and made a complete stereographic survey of it.

The Visser expedition of 1925 traveled in the unknown portions of the Hunza Valley above Gilgit and mapped 2580 square miles (P. C. Visser: Explorations in the Karakoram, *Geogr. Journ.*, Vol. 68, 1926, pp. 457–473). It was thought at the time that nothing was known of the upper Shingshal Valley, but a report made in 1908 has since been discovered in the files of the Political Officer at Gilgit (Himalayan Notes, *Geogr. Journ.*, February, 1930, pp. 166–172). Further exploration partly to the east and partly to the west of the main Hunza Valley and more especially in the Shingshal Valley was carried on by Captain C. J. Morris and Mr. H. F. Montagnier in 1927 (see *Geogr. Journ.*, Vol. 71, 1928, pp. 513–537).

Mr. and Mrs. Visser paid particular attention to the glaciers, four of which were discovered to be of exceptional size with lengths of 23, 26, 32, and 37 miles. The longest was the Batura Glacier, which is remarkably flat with a slope of only 2000 feet in twenty miles. In one place a stream on the ice was even found running in a direction opposite to the movement of the glacier. Along the northern margin of the Batura Glacier, and the case is similar to other glaciers that extend either east or west, there is a wide longitudinal depression between the ice and the valley wall, probably due to the melting that results from the reflection from the north wall of the valley. This flat morainal valley is 1500 feet wide at a distance of twelve miles from the end of the glacier and has a stream and trees. Fine views of this glacier are to be found in Visser's article on the mountains and glaciers of Central Asia in the *Zeitschrift des Deutschen und Österreichischen Alpenvereins* for 1927 (pp. 106–125). The presence of these great ice streams on the northern slopes of the Karakoram is an unsolved problem. The precipitation is certainly less than that of the southern face; the lower temperatures and decreased melting may account for the situation. An excellent systematic account, "Von den Gletschern am obersten Indus," is given by Visser in the *Zeitschrift für Gletscherkunde* for 1928 (pp. 169–229).

Two popular travel accounts of the Visser expedition are "Zwischen Kara-Korum und Hindukusch," by Mr. Visser (Leipzig, 1928), and "Among the Kara-Korum Glaciers in 1925," by Mrs. Visser (London, 1926).

Mr. and Mrs. Visser returned to the Karakoram in the spring of 1929 and by the end of the season had succeeded in mapping 2300 square miles of practically

unexplored country in the neighborhood of the Siachen Glacier and the Shyok. The party wintered in eastern Turkestan and are continuing their surveys and glacier studies this current season (*Tijdschr. Kon. Nederl. Aardrijksk. Genootschap*, January, 1930, pp. 1–8).

"Im Land der Stürme" (Leipzig, 1930) is Dr. Emil Trinkler's story of his 1927–1928 expedition across the Karakoram and Kunlun into the Taklamakan Desert. Dr. Trinkler, who is primarily a physiographer, was accompanied by the geologist Dr. de Terra and the botanist M. Bosshard. The expedition started from Srinagar, as did also Mason and Visser, and worked from the country north and east of Leh to Kashgar, Yarkand, and Khotan. An account in English of this same expedition is to be found in the *Geographical Journal* for June, 1930 (pp. 505–517).

Trinkler, who is interested in climatic changes, makes a number of references to old moraines and strand lines on the Tibetan Plateau. He believes that much of northwestern Tibet was once covered with a mantle-like sheet of ice. After the ice age there was an extensive lake in Sinkiang, portions of which continued as late as the fourth or fifth century (*Geogr. Journ.*, March, 1930, pp. 225–232).

This note may be appropriately closed by a reference to the papers on Karakoram nomenclature by Visser and Mason in the August, 1930, number of the *Geographical Journal*.

GEORGE B. CRESSEY

Sand Desert of Southeastern Karakum. The results of a systematic campaign for the understanding of the sandy desert and for control of drifting sand are presented in a recent monograph by V. A. Doubiansky on "The Sand Desert of South-Eastern Karakum" (*Bull. of Applied Botany, of Genetics and Plant Breeding*, Vol. 19, Leningrad, 1928; in Russian with English summary).

The sandy deserts of Turkestan have been explored by Mushketov and Obruchev, but the investigations of Doubiansky rest not only on exploration but on the accumulated data obtained at the observation station of Repetek founded and supported for the years 1912 to 1917 by the Russian Geographical Society and reopened by the Institute of Applied Botany in 1925. Here meteorological observations and studies of the physical properties of the sand have been carried on (see *Geogr. Rev.*, Vol. 19, 1929, pp. 688–690). The observations at Repetek demonstrate that the sands undergo an evolution in which the growth of vegetation is intimately related to the successive processes and to the development of land forms. The sands originate from the rocky slopes of marl and sandstone of Tertiary age, as held by Obruchev, and in much the greater part from the widespread alluvium laid down in overflow by the existing and ancient channels of the Amu-Darya. In the "nascent" stage there are small heaps of sand in the deflational areas, but these areas are small. In the second stage barchans form, or rather barchan ridges, 3 to 10 meters high. The barchan ridges are affected by the alternating winds of the region and completely reversed each year. At each season the dune ridges move 15–20 meters, but six years' observations at Repetek fail to show which direction of movement is dominant. Along the cultivated strip that borders the Amu-Darya dunes advance into the fields at a rate of two meters a year or more.

The third stage of development consists of sand hills more or less fixed in position by vegetation. Here four sequences distinguished by characteristic plants can be recognized. The final sequence is marked by more or less continuous forests of the salt saxaul (*Arthrophytum haloxylon*). The salt saxaul is to be regarded as the climax vegetation, which by the processes of its growth and decay prevents changes in the surface by wind and the introduction of other plants. It is a feathery shrub which attains a maximum height of six meters. It has a general resemblance to a very large sagebrush and forms a "forest" much like many stands of mesquite.

The woody stems contain considerable quantities of salts, which are returned to

the soil as the wood falls and dies. Hence the surface soil becomes more and more salty, which character, together with its increasing content of fine dust, prevents the growth of other large plants. Herbaceous species grow between the salt saxaul bushes and afford a scanty forage.

As the salt saxaul forests constitute the only supply of wood, they have been subjected to ruthless exploitation with the result that in places the sand has begun to blow. The earlier pioneers have replaced the useful salt saxaul. Measures of control and study are advocated. Similarly fences, planting, control of grazing, and irrigation with waste water are advocated as the proper means of controlling the sand that invades the fertile valley of the Amu-Darya.

The process of improvement of the region by control of the vegetation, "phytomelioration," must be used not only in the positive sense but also the negative or regressive sense in the transitional area along the Amu-Darya. The barchan ranges are the principal source of fresh water and should therefore not be allowed to become covered with vegetation which would increase the salt content. Such a retention of primitive conditions is not an undue sacrifice, as they occupy only about 9000 square kilometers of the area. On the other hand, the sandy ridges of the southern part of the area comprising about 15,000 square kilometers have by reason of the removal of sheep become so thoroughly grassed over that the forage is poorer than if judicious grazing were practiced.

KIRK BRYAN

AUSTRALASIA AND OCEANIA

Economics of Australian Coal. Among the few writers on economic problems in Australia who sufficiently stress the geographical background, none has done better work than F. R. E. Mauldon. In 1927 appeared his book on the economics of the Hunter Valley; and in 1929 he published "The Economics of Australian Coal," a general study of the coal industry in Australia. The book is in three parts, of which Part I deals with the foundations and structure of the industry; Part II with economic problems; Part III with the solution of the problems. The first part is of considerable importance to geographers, the other two deal chiefly with financial problems.

Mauldon considers first the estimates of Australian coal and shows that the point of view of the geologist and that of the coal user may differ materially, since the latter has no interest in unworkable deposits. He gives the following figures of actual *proved* coal (in million tons): New South Wales 20,000, Queensland 410, Tasmania 125, Victoria 20 (but with a reasonable estimate of 30,000 of brown coal). South Australia has a little brown coal. Western Australia has an unverified *probable* total of 3500 million tons of black coal. He accepts the Ottawa Congress figures (1913) for probable supplies, with little variation, as 133,000 million tons of black coal and 32,000 million tons of brown coal. This gives Australia 2.56 per cent of the world's probable supply and makes her rank sixth, following the United States (48.6 per cent), China (17.7 per cent), Canada (11.9 per cent), Germany (4.3 per cent), and Britain (3.4 per cent).

A useful discussion of the effect of locality in coal exploitation follows. The Newcastle coal field is compact, is situated on the sea, and produces 83 per cent of the black coal used. New South Wales is the sole state that exports coal, either to other Australian states or abroad. Queensland has scattered resources but produces 8 per cent of the black coal, chiefly from Ipswich. Victoria supplies 4½ per cent, nearly all of which is brown coal from Yallourn. This latter deposit has the greatest thickness in the world, amounting to 780 feet in one bore. It is being developed by the state along the most modern engineering principles. In an open cut, 2400 feet long and half that width, the coal is scooped out to a depth of 70 feet by electrical shovels. One-third is dried and sold as briquettes, two-thirds is converted into electricity and then transmitted through Victoria.

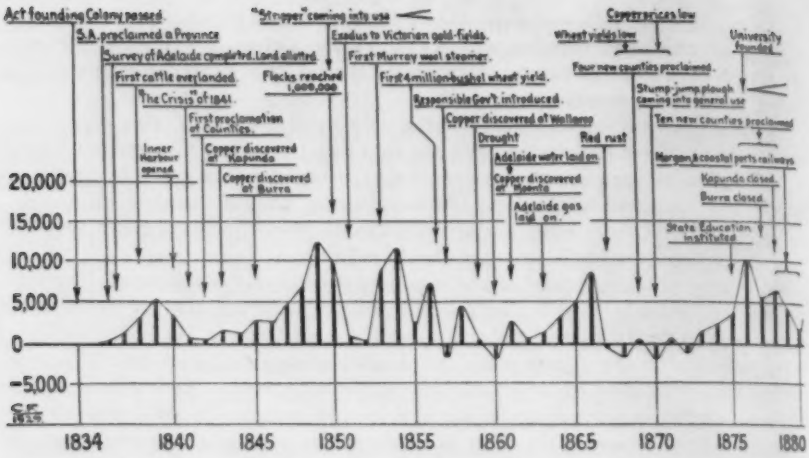


FIG. 1—"Prosperity graph" of South Australia reproduced on a reduced scale from Dr. Fenner's paper cited below.

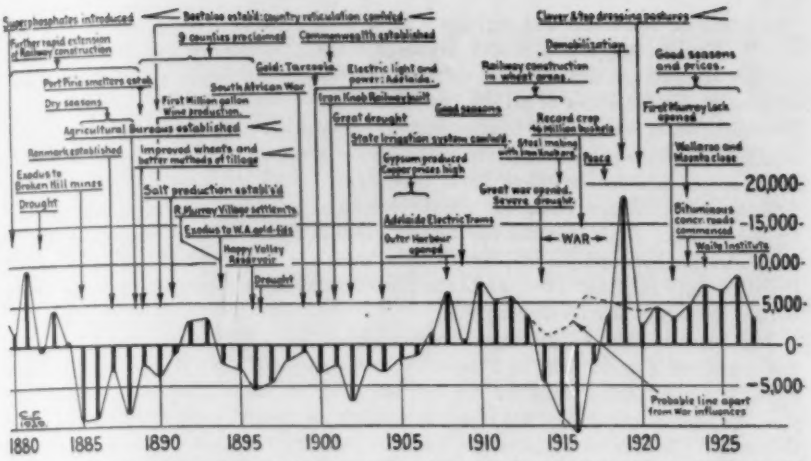
The author deplores the old-fashioned methods generally in use and considers that mining should be done much more cheaply since for the most part the coal is easy to mine. No less than 60 per cent is got from seams over 14 feet thick. Another interesting chapter deals with the marketing of coal. About 46 per cent of the New South Wales coal goes abroad or to Victoria and South Australia. For a number of reasons this export has dwindled sadly. Mauldon analyzes the reasons for this decline. The chief foreign export was to New Zealand, where the development of local coal and of hydro-electric power has greatly cut down the sale of Newcastle coal. Java is now being supplied from Natal which is becoming a real rival to Newcastle, Australia. In China the immense supplies of Kailan and of Fushun (in Manchuria) are spoiling the Australian trade. Chile was another good customer, but she is developing her own coal and has placed such a duty on imported coal that the Australian trade is dead.

The later chapters of this interesting book show that disputes have resulted, in the Newcastle fields, in a waste of 24 per cent of the workdays. The payment to the miners for hewing has gone up in recent years, though the output per man is not satisfactory. Even so there is overproduction, and Mauldon comes regretfully to the conclusion that one quarter of the mines should be closed and that 5000 miners should be drafted into other trades.

A concise statement of these views by the same writer, entitled "The Crisis in the Australian Coal Industry," appears in the *International Labour Review* for February, 1930.

GRIFFITH TAYLOR

South Australia. By the device of the "prosperity graph" (see Fig. 1) Dr. Charles Fenner graphically summarizes the growth of the state of South Australia from its foundation, nearly a hundred years ago, to the present. The story is told in detail, with many other excellent illustrations, in "A Geographical Enquiry into the Growth, Distribution, and Movement of Population in South Australia, 1836–1927, the second paper (Vol. 53, 1929, pp. 79–145) of a trilogy appearing in the *Transactions and Proceedings of the Royal Society of South Australia*. The first paper (Vol. 51, 1927, pp. 193–256) appropriately deals with Adelaide, the one great urban center of the state. The latest available figures (1928) give the population of the city and its suburbs as over 330,000, nearly 60 per cent of the population of the state; Port



The yearly gain or loss of population (natural increase plus immigration minus emigration) with indication of important contributory events.

Pirie, the town next in size, has only 9527. One can but praise the foresight of Colonel William Light, who saw the "incomparable geographical advantages" of the site and laid out the city (see A. Grenfell Price: Founders and Pioneers of South Australia, Adelaide, 1929). The third paper treats of "The Major Structural and Physiographic Features of South Australia" (Vol. 54, 1930, pp. 1–36).

All the papers reveal the critical importance of the rainfall factor. The response of the prosperity graph to "drought, the most antagonistic of controls," is striking. One of the advantages of Adelaide is its situation in the Spencer-Vincent Sunkland, with a water supply made available by the comparatively high rainfall of the Mt. Lofty Ranges and their facilities for the building of storage reservoirs. Even so, "in the final analysis the limiting factor in the growth of Adelaide will probably be found to be the water supply."

The second paper confines itself to "The Counties," the southern portion of the state, for excepting a sparse and fluctuating pastoral occupation of the northern division, this is where the people reside. The Counties, with an area of 85,000 square miles (nearly the area of Great Britain), has seven persons per square mile; the northern division with 295,000 square miles has one person per sixty square miles. The boundary line is roughly coincident with the 10-inch rainfall line. It marks the limit of agriculture as far as present practice is concerned; indeed county delimitation may be said to have gone beyond the safe limit, largely in a "burst of optimism" in the late seventies. Even better as an expression of the limit of agriculture is the 8-inch winter rainfall line. Four of the counties north of this line now return no official harvest estimates. Dr. Fenner's final conclusion is that "future efforts should be devoted to the occupation of areas yet unoccupied in the counties, and to the more intense utilization of well-watered land that is already under occupation."

The whole of the state is included in the physiographic discussion of the third paper. Special attention is devoted to drainage. "Where running water is rare and rainfall low, all streams become of greater importance. In a land where water is the great need, every source of supply must be known and exploited." A series of sketch maps shows the principal drainage systems. Dr. Fenner has adopted with advantage de Martonne's system of classification—exoreism, andoreism, areism, —and, using the newest and most detailed information, has found close agreement with his expression of the situation in South Australia (Emmanuel de Martonne: Regions of Interior-Basin Drainage, *Geogr. Rev.*, Vol. 17, 1927, pp. 397–414). "On

the whole de Martonne was perhaps a little more generous than circumstances permit." Fenner suggests a fourth drainage class, cryptoreism, for areas where no surface streams are developed in spite of a comparatively high rainfall, i. e. a value of over 30 for the index of aridity (de Martonne's formula $P/(T + 10)$, where P is precipitation in mm. and T temperature in degrees C.). Such an area occurs in the southeastern corner of South Australia where a peculiar arrangement of the old dune ridges and an incipient karst topography have led to the development of underground drainage, though in the rainy season water may travel "in wide sheets" on the surface. This area has the highest value in the state for the index of aridity, 32. The northern margin of The Counties has 9.1, slightly less than de Martonne's limit for "dry steppes" (10), while the central Lake Eyre Basin has only 4.1, falling within the limits of true desert (5).

The heart of this arid northeastern section of South Australia, Lake Eyre itself, has remained a good deal of a mystery, towards which Mr. C. T. Madigan has recently contributed a solution. In August, 1929, he made an aerial reconnaissance over the region, confirming his observations with a ground expedition the following December (An Aerial Reconnaissance into the Southeastern Portion of Central Australia, *Proc. South Australian Branch of the Royal Geogr. Soc. of Australasia*, Vol. 30, 1930, pp. 83–108; Lake Eyre, South Australia, *Geogr. Journ.*, Vol. 76, 1930, pp. 215–240). "It is indeed an inhospitable region, visited only by occasional stockmen mustering cattle during good seasons, and even their activities have ceased during the past seven years of drought. . . . The whole region has been held under pastoral leases, but there has never been a homestead within 20 miles of the north lake, and the few habitations in the area are now mostly abandoned. The latest to go was Muloorina, for twenty years a Government camel depot. The last of the starving camels were destroyed last year."

The lakes could not have been seen under drier conditions. Lake Eyre has no permanent water; at least two-thirds of its surface is occupied by a salt crust, typically of buckled slabs presenting a "pink featureless expanse" that strongly suggested to the explorer the pancake ice of the Antarctic seen under pink sunset skies. The salt shows no obvious banding, and it is remarkably deficient in potash, a fact which suggests that Mr. R. Lockhart Jack's cyclic theory of the origin of the salt of the more southerly lakes of South Australia must be extended to include Lake Eyre.

GEOGRAPHICAL NEWS

The International Geographical Congress, Paris, 1931. Following the decision taken at Cambridge in 1928 the International Geographical Union holds its next congress at Paris, September 16 to 24, 1931.

Regulations drawn up by the General Assembly of the Union at Brussels in 1924 require the congresses to include (1) meetings for the discussion of general questions, (2) meetings for the discussion of local questions of special interest to the organizing country, (3) geographical excursions (Report of the Proceedings of the International Geographical Congress, Cambridge, July, 1928, Cambridge, 1930). The program of the 1931 meeting announces the presentation of the reports of the commissions appointed or reappointed at the Cambridge meeting and dealing respectively with types of rural habitation; Pliocene and Pleistocene terraces; climatic variations, especially during the historic period; flora and fauna population of mountains; paleogeographic maps of the Plio-Pleistocene for study of the geographical environment of early man; preparation of a map of the Roman Empire on a scale of 1:1,000,000; publication of photographic reproductions of ancient maps. The commissions, representing research enterprises of an international nature, have proved successful in giving unity and purpose to the meetings (compare "The International Geographical Congress," *Geogr. Rev.*, Vol. 18, 1928, pp. 661–667).

As a further means of focusing the work of the Congress and preventing the dissipation of its energies the Paris meeting is trying the experiment of a limited program for the papers offered by members. However, the program remains broad enough to satisfy all major interests. Under topography and cartography are included: high mountain topography; aerial phototopography; representation of relief on maps; rapid methods of mapping in tropical regions; proposal to publish every three years, on the occasion of the meeting of the International Geographical Congress, a résumé of the topographical and cartographical works executed by the geographical services of the various states; and the presentation of special cartographical works. Under physical geography: rivers of glacial origin; probable or possible river captures; conditions peculiar to the erosion pattern in tropical countries with a dry season and in hot countries without a well defined dry season; continental dunes; and, with special reference to Europe and most particularly to France, definition and study of local climates; Tertiary peneplains; karst erosion in comparison with normal erosion. Under biogeography: the influence of man on the distribution of living creatures, exclusive of cultivated plants and domesticated animals; and the origin and dispersal of certain cultivated plants. Under human geography: the localization of industries; urban agglomerations; distribution of human settlement in tropical countries; means of rapid transport in tropical regions; irrigation in countries of low rainfall; methods of representing density of population; and geographical conditions especially as regards economics of the control of rivers for navigation and production of hydro-electric power, especially in Europe and most particularly in France. Under historical geography: the origin of modern cartography; the cataloguing and critical study of ancient itineraries, especially in France; the critical study of ancient cartographical documents; and the study of unpublished journals of explorers in extra-temperate regions since the seventeenth century.

Two series of excursions have been arranged. The first series, which precedes the Congress, includes the excursions: the Jura and Fore-Alps of Savoy, led by André Cholley and Georges Chabot; the southeastern section of the Central Massif (Cévennes and Causses), led by Henri Baulig; the Auvergne, led by Philippe Arbos; and the Alps of Dauphiné, led by Jules Blache. The series subsequent to the Congress includes the excursions: Paris to Rouen and Havre, led by Albert Demangeon; the valley of the Seine and the coast of the Somme Bay to the North Sea, led by E. Chaput and Abel Briquet; the coast and Rhone valley country of Provence, led by Ernest Bénévent; and Algeria, led by Augustin Bernard.

Membership in the Congress is open to members of "a Geographical Association or an Institution or a Service whose activities bear some relation to geography." Relatives accompanying members may also be registered. The registration fee is 125 francs, and application should be made on the form provided by the Secretariat. The seat of the Congress and the Secretariat is the Institut de Géographie de l'Université de Paris. Professor Emmanuel de Martonne is the General Secretary.

Participation of the geographers of the United States is being arranged through a national committee of geographers chosen by the National Research Council. Through the chairman of that committee, Dr. Isaiah Bowman, a wide consultation is being held on the part of the geographical societies of the country, college departments of geography, and bureaus and special institutions that have geographical interests, to the end that there may be full American representation. The matter was specially considered by the Association of American Geographers at its annual meeting, December 29–31, 1930. Official representation will be decided by the National Research Council.

GEOGRAPHICAL REVIEWS

Russia in Development and Other Essays

Iorwerth C. Peate, edit. **Studies in Regional Consciousness and Environment. Essays Presented to H. J. Fleure.** xii and 220 pp.; maps, diagrs., ills. Oxford University Press, 1930. 10 x 7 inches.

This unusually interesting collection of essays has been presented to Dr. H. J. Fleure by former students in appreciation of "the inspiration to research" which he has given during twenty-five years' teaching at the University College of Wales, Aberystwyth. It opens with "An Outline of some Factors in the Development of Russia, with special reference to European Russia," by R. M. Fleming, a paper remarkable for comprehensiveness of view and clarity of expression and an excellent introduction to any study of the new Russia.

Over all there is the immensity of the country, the vast plains stretching north and south, east and west—an unwieldy territory that lends itself to experimentation. The experiment of cultural autonomy, for instance, is being tried to satisfy the aspirations of the great variety of ethnic groups. Definition of these divisions alone raises multifold problems. Miss Fleming cites as a particular example the difficulties arising over the boundaries of pasture grounds in the Transcaucasus. Among results of special geographical interest cultural autonomy has given an impetus to regional survey, and an extensive literature is being accumulated on little-known regions. In Leningrad in 1926 an educational institute—everywhere in Russia the desire for education is keen—for northern nationalities was established. "Its 200 students include Samoyedes, Kamchadals, Golds, Tungus, Ostyaks, Lapps, Gilyaks, Chukchee, etc. Many hardships have to be overcome by these students in their long journey, sometimes occupying months, across trackless marshy wastes." Set this beside the recent discovery in the Leningrad province of "tribes speaking Vep, Izhor, and Vod dialects, thought to be extinct; one settlement of Veps in the Lodeinopol district of this important province had not developed to the stage of using wheeled vehicles."

Russia is still an empire in the making. Yakutsk, capital of an autonomous republic, built on frozen subsoil, illustrates the northward advancement of Russian colonization. It is 800 miles from the nearest railway station. The completion of the Turk-Sib railway, skirting the western boundary of China more or less along the course of the old post road from Semipalatinsk to Tashkent, has been described as "a romantic chapter in empire building" (see Bruce C. Hopper: Soviet Transport Plans: Winning the East, *Foreign Affairs*, July, 1930, pp. 652–657). Details of the work of construction, which was completed ahead of schedule against formidable physical obstacles, and of the objectives of the line are given in *V. O. K. S.* (Organ of the Soviet Union Society for Cultural Relations with Foreign Countries) for March, 1930. Other important railway plans aim at the improvement of existing facilities, for instance the creation of trunk lines affording a southern outlet for Siberian grain. River communications have been important in the past, but they are hampered by long winter frost—Miss Fleming has a map showing number of days that the rivers of European Russia are frost-bound—and summer drought and lack of adequate canal links. Work is scheduled to begin on the Volga-Don Canal, but the canal will operate only 240 days of the year.

Air transport and wireless communications are proving of vital importance. Miss Fleming refers to the function of wireless in the development of the Kara Sea trade

route (see also W. L. G. Joerg: Brief History of Polar Exploration Since the Introduction of Flying, *Amer. Geogr. Soc. Special Publ. No. 11*, 1930, pp. 48–49) and in the administration of remote regions such as Kamchatka. The strategic value placed by Russia on air services has not been lost on other nations. Speaking of projects for 1933 the late Lord Thomson said, "What do those 26,000 miles mean? They mean linking up Moscow by means of a network of air-lines with the northern frontier of Afghanistan, and a line through to Kabul. They mean linking up Russia with the Black Sea and the Caucasus, with branches to Tehran and Baghdad. Mighty tentacles, of great significance to the British" (The Development of Aviation in Asia, *Journ. Central Asian Soc.*, Vol. 17, 1930, pp. 273–284).

A special branch of the Russian Academy of Sciences is studying road construction in relation to soil and climatic difficulties. The general importance of Russian work on soils naturally comes in for attention. The zonal distribution of the soils is used by Miss Fleming as the basis for a characterization of types of settlement, crystallized in four attractive maps of areas about Archangel, Nijni Novgorod, Odessa, and Kiev.

The essays testify to the wide range of Dr. Fleure's own geographical interests. R. U. Sayce, in "The Transport Ox and the Ox-wagon in Natal," deals with an important phase in the history of communications in South Africa. A striking photograph of the Valley of a Thousand Hills showing a watershed road forms the frontispiece to the volume. "Sociographs of the Kolymans, Andamanese, and Palaungs," by L. Garrard, is a suggestive "attempt to show the relation between climate and the activities in the lives of primitive people" in graphic form. F. F. Laidler contributes "Notes on the Limits of Certain Cultures in Spain," and E. Estyn Evans, "The Pyrenees: A Geographical Interpretation of their Rôle in Human Times." Susan Harris writes on "Settlements and Field Systems in Guernsey," a study for the Rural Habitat Commission of the International Geographical Congress. Historical and prehistorical distributions and local Welsh studies are among the other papers, and the volume concludes with "Science and the Sea," by T. A. Stephenson, a member of the Great Barrier Reef Expedition.

The Soil Map of Asia

Contributions to the Knowledge of the Soils of Asia. 44 pp.; maps. (Dokuchaiev Inst. of Soil Sci., Publ. No. 1.) Academy of Sciences of the U. S. S. R., Leningrad, 1930. 10 x 7 inches.

A general soil map of Asia is in process of compilation by the Dokuchaiev Institute of Soil Science of the Academy of Sciences of Soviet Russia. In this compilation it is necessary to bring into conformity the different maps of various authors showing soil distribution in various parts of Asia. The separate and original soil maps must be altered in scale, terminology, etc., to fit the generalized scheme of classification. In order, however, to preserve these bases it is planned to publish them, together with brief texts, as separates. In this first number of "Contributions to the Knowledge of the Soils of Asia," 1930, there appear the soil maps of Japan and Manchuria.

"On the Soils of Japan," by Mrs. O. N. Mikhailovskaia, contains a soil map of Japan, Korea, and Formosa in five colors on a scale of 1:6,000,000. Admittedly it is a compilation and not the result of recent field studies by the author. Previous publications on the soils of Japan, Glinka's soil map of the world, and publications on such allied topics as geology, climate, and vegetation have been used in preparing the map. After its completion it was submitted to Dr. Aso and Dr. Seki of Japan, but the amendments made by these scientists, owing to their late arrival, have not been included. For the sake of comparison, however, soil maps in black and white for South Sakhalin, Hokkaido, and Formosa as prepared by Dr. Seki have been appended.

The first systematic investigation of soils in Japan, under the supervision of M. Fesca of Göttingen University, was begun in 1882. On the resulting maps the geological age and petrographic character of the underlying rocks were shown in color while the soil characteristics were indicated by shadings and conventional symbols. This work contained no description of soil profiles. The Scientific Agricultural Society in Tokyo prepared a scheme of classification and nomenclature of soils and new methods of soil investigation and presented it before the Third Pan-Pacific Science Congress in 1926. It represents a genuine step forward with regard to differentiation of soil types, but it still contains no terminology relating to processes of soil formation.

Geology, orography, climate, and vegetation of Japan are given preliminary discussion. Five climatic soil types are recognized, and their characteristic locations are elaborated upon.

"On the Soils of Manchuria," by Miss V. A. Baltz and B. B. Polynov, is an explanation of a reconnaissance soil map of Manchuria in black and white on a scale of 1:8,000,000. A summary of the salient features of climate and orography of Manchuria is given, and that province is subdivided into seven natural regions. For each of these subdivisions conditions of climate, relief, natural vegetation, and soils are then presented in more detail. Occasionally features of land utilization are mentioned. The soil map recognizes fifteen soil types.

GLENN T. TREWARTHA

PROBLEMS OF OVERPOPULATION IN ASIA

ÉTIENNE DENNERY. **Foules d'Asie.** 247 pp.; maps. Librairie Armand Colin, Paris, 1930. 15 frs. 7½ x 4½ inches.

"Foules d'Asie" is an important and stimulating general summary of the problems of overpopulation in Asia. It brings together in one small volume Japan's problems of food supply and overpopulation, China's disorganization and the consequent penetration of Chinese people into other lands, and India's serious problem of undernourishment and the necessity of emigration. It presents the pressing need of these three nations for an outlet for their surplus multitudes, against the background of the white man's restrictions upon Oriental immigration into the other continents.

The first part of the book is devoted to Japan's problems and their remedies. It reviews the rapid increase in population since the opening of the country, the pressure of the people upon the land, the problems of the tenant farmers and of the landowners, the spread of agrarian discontent, the growth of cities, the dislocation of hand labor by the machine, unemployment among the white-collar groups, and the development of disruptive social forces. In reviewing the possible remedies, M. Dennery points out that emigration has failed as an effective outlet both because of the restrictions of the countries of immigration and because of the disinclination of the Japanese to colonize. The idea of birth control has made slow progress among a conservative people. Industrialization has created new employments and stimulated production but at the price of disrupting the old economic order and dislocating labor; and it is faced with three major difficulties—lack of raw materials, inefficiency of labor, and insecurity of markets. M. Dennery considers the extension of agriculture up the mountain sides through the growing of tree crops and the development of animal husbandry on steep slopes as the most promising solution for Japan's population problem. The emphasis upon such a remedy is a commentary upon the author's European background, but the suggestion is presented with no supporting facts and with no consideration of the tremendous difficulties to be overcome by the Japanese in any exploitation of their mountains. M. Dennery also does not recognize sufficiently the necessity of maintaining the forests of the higher altitudes as a source

of timber. It is difficult to see in Japan's mountains any effective relief for a population increasing by about 900,000 annually.

The second part of the book is devoted to Chinese expansion, the flight from famines, civil wars, banditry and insecurity, and the search for wealth in new countries. It presents the conflict in Manchuria between Japan and China, the colonization by the Chinese people on the one hand and the economic exploitation by Japan on the other, but perhaps lays too much emphasis on Japan's success and economic control without pointing out important obstacles to her progress there. In some instances the author has been too ready to accept without question statements that have appeared in the Japanese press regarding Japanese achievements in Manchuria. The problems of Chinese immigration into other countries, especially Indo-China, where it is the commercial classes that have migrated, and Malaya and Southeast Asia, where both the laboring and the commercial classes are important, are discussed; and the solidarity and the power of the Chinese merchant class in these regions are pointed out. The Chinese immigrant is represented as ambitious, a voluntary exile from his native land in search of wealth, adventure, and advancement.

The Indian emigrant, on the other hand, is represented as an exile by necessity. The fact that South Africa and the lands of the white man have been closed to Indian immigration has stopped the flow of the ambitious, adventurous, commercial classes of India and has limited the exodus to the famine-stricken and the destitute who go out as laborers. Unlike the Chinese, most of the Indian emigrants leave their native land unwillingly and without hope of quick riches in the foreign land. Until the Indian government intervened against the practice, they went, forced by necessity, as indentured labor, virtually as slaves. Now they go as free labor but still only through necessity and unwillingly. The causes of India's overpopulation, according to M. Dennery, are the uncertainty of agriculture, the extreme density of the population, and the influences of Occidental industrialization. Too much emphasis is placed on the last point, especially upon the disappearance of the hand industries, for they still serve as important occupations for the rural population throughout the country.

In his conclusion M. Dennery disposes of the yellow peril as such but points out the existence of serious problems in the pressure of population throughout Asia and the menace of overpopulation to the peace of the world. Race rancor has been generated by the immigration barriers erected by the white man, but it is questionable whether the author's contention that overpopulation has been the primary cause of internal disorder in the countries of Asia is correct. The huge size of India and China and their topography, which divides these countries into isolated areas, are probably much more important factors. There is no serious disunity in Japan. That the internal disorders of China and India are a menace to the peace of the world and invite conquest by ambitious foreign nations, however, is undeniable. Confined to their own continent by the restrictions of the white man, the countries of Asia must expand at the expense of one another. As long as they are disorganized the mere force of their numbers cannot constitute a menance to the nations of the West. An organized and united Orient would be altogether another problem.

JOHN E. ORCHARD

A TECTOGENETIC STUDY OF THE FAR WEST

ALBRECHT PENCK. **Geomorphologische Probleme im Fernen Westen Nordamerikas** *Sitzungsber. Preuss. Akad. der Wiss.*: Phys.-math. Klasse, Berlin, 1929, pp. 187–218.

This learned and penetrating essay by Professor Albrecht Penck of Berlin, based on his five visits to the western United States in the last thirty-three years, is, in spite

of its title, less concerned with surface forms than with understructures and their causes; it is not a morphologic but a tectogenetic study.

The highlands of the West are subdivided and examined as to the causes of the movements by which they gained their present altitudes, R. T. Chamberlin's compression formula being used in the somewhat mathematical method of discussion here employed. The upheavals of the Black Hills, the Bighorn Mountains, and the southern part of the Rocky Mountains are ascribed to isostatic movements supplemented by vertical uplift exerted by the geoplasma (a term which is preferred to Airy's "lava" and Daly's "basalt glass"), with the result of slightly broadening the space they occupy and of stretching their crests and slopes; volcanic eruptions are causally associated therewith. A similar explanation is found for the upheaval of several plateaus. The folded structure of certain mountains in Wyoming and Idaho is thought to be of relatively small depth and is ascribed to a gravitative sliding of the strata on a slanting floor within the outer crust. The folding of the strata in the Basin Ranges is referred to a similar cause; the later extensional faulting of the range blocks is left without explanation. The geoplasmic movements are ascribed to melting and crystallizing, and the associated swelling and shrinking are regarded as efficient causes of uplifts and depressions in the passively overlying crust. A review of western geological history is believed to give support to this hypothesis.

The final conclusion of the essay is that the upheaval of our western highlands is not the result of compressional folding but of vertical forces, which have had a far more important part in determining the reliefs of the earth's surface than is usually supposed. Judging by the emphasis given to this conclusion, as well as by the citation of various European authors who ascribe the present altitude of mountain masses of folded structure to lateral compression, it would seem that the importance of vertical forces in bringing about the present altitude of various mountainous highlands and plateaus is less recognized in Europe than in America; for, with regard to mountains in particular, is it not generally understood among the geologists of the United States that very few if any important mountain ranges—with the possible exception of the outer Himalayan ranges—are now in the cycle of erosion that was initiated by the folding of their strata: that the relief then generated has been more or less completely worn out, and that the present relief is due largely to deep dissection after noncompressional upheaval? But Penck's essay adduces new evidence in support of this view.

W. M. DAVIS

FOG STUDY IN CALIFORNIA

HORACE R. BYERS. **Summer Sea Fogs of the Central California Coast.** 48 pp.; maps, diagrs. *Univ. of California Publs. in Geogr.*, Vol. 3, No. 5, pp. 291–338. Univ. of California Press, Berkeley. 1930.

The author has taken advantage of the observational work of the experimental airways weather service conducted by the Daniel Guggenheim Fund for the Promotion of Aeronautics during the fourteen months ended June 30, 1929, and on the data gathered has based a study of the summer sea fogs of the central California coast, dealing especially with conditions on the land and ocean favoring formation and spread of fog, free-air conditions, fog distribution, and methods of forecasting.

The author assumes that this type of fog is formed over the ocean by condensation of water vapor in saturated air on passing from a warm to a colder water surface, a hypothesis accepted generally by meteorologists. He describes at some length the general barometric pressure situation over the North Pacific Ocean and the western parts of North America, and illustrates them and their accompanying wind systems by means of charts showing the mean monthly air transport and isobaric systems. He describes at some length the part played by upwelled cold water off

the coast in causing condensation of water vapor from air that is moving from the ocean to the land in response to differences in air pressure set up by abnormal heating of the air over the land during the warm months. Charts of surface-water temperatures for the summer months show them to be the lowest along the coast immediately north of the Golden Gate, and it is this part of our west coast that is most subject to fog.

Where the fog first begins to form offshore is not definitely known, for there are times when the North Pacific Ocean generally north of the latitude of San Francisco may be under what is termed high fog—actually stratus cloud. I have been told that on the passage from San Francisco to the Orient, over the middle steamer route, there have been occasions in the summer months when the sun was not seen from the time of departure until Japan or China was reached; but it is assumed that such instances are exceptional. That fog is relatively more frequent, however, over the cold waters adjacent to the California coast than farther west over the ocean is well established.

It does not always follow that the fog over the ocean moves inland, for there are many days when the air that flows during the day from the ocean to the land is devoid of fog, and yet during the late afternoon or during the following night, after the movement of air from the ocean to the land has ceased, high fog (stratus cloud) forms over the coastal valleys and the inland waters and persists through the night and into the following morning. The stratum of air in which this type of high cloud forms is very shallow, as has been determined by observations from meteorological stations on Mt. Tamalpais and Mt. Hamilton and by observations made by airplane and seaplane. A person descending by airplane from the air above into the stratum of air that had its origin over the ocean is instantly made aware of that fact, for the upper air is warmer by many degrees. In fact, it is generally recognized that without the warmer and drier air above the stratum of air of ocean origin the high fog does not form; but the part that the temperature "inversion" has to do in the process involved in the formation of high fog has not been clearly stated by the author. That it is in some way connected with nocturnal radiation in the free air there can be no doubt.

No precept or set of precepts is given by the author on which to base forecasts of the occurrence of summer fog on the California coast; but he makes the statement that free-air observations of temperature, humidity, etc., are essential to successful forecasting of its formation and dissipation. He cites the free-air observational work by airplane by the U. S. Naval Air Station, San Diego, as fundamental to successful forecasting of fog on that part of the California coast.

E. H. Bowie

The Antarctic Regions

Griffith Taylor. **Antarctic Adventure and Research.** xi and 245 pp.; maps, diagrs., ills., bibliogr., index. (Appleton New World of Science Series.) D. Appleton and Co., New York and London, 1930. $2.00. 8 x 5 inches.

Professor Taylor was leading geologist and physiographer on Captain Scott's last expedition in 1910. As such it fell to him to impress on Scott the problems and importance of geological research, in much the same way as Professor Edgeworth David had been Shackleton's mentor and inspirer in 1907. Scott till then was more fascinated by the problem of origin of the Ross Barrier (or, as Professor Taylor calls it, the Ross Ice Shelf); Taylor made him a geologist, and when Scott spent a precious day collecting fossil plants at the head of the Beardmore Glacier he must almost unconsciously have been reacting to the geological enthusiasm and personality of his young scientist. Taylor's book should have the same effect now, but on a much wider public: it is written with vigor and with the freshness and authority of the man who has been on the spot. It states the objects of scientific

exploration of the South Polar Continent and the seas surrounding. Furthermore, that the picture should be complete, it tells the story, perhaps almost too briefly, of Antarctic discovery and adventure.

Twenty years is a long interval, and changes have been as rapid in Antarctica as in Alaska; Taylor has tried to keep pace where possible with the new conditions, as is well shown by his account of the work of the Discovery Committee. Mistakes are rare in his book; but one should perhaps mention the use of the misleading term "bay ice" and a statement, denied by Scott, that Shackleton was once dragged on a sledge. Looked at as a whole the book is not so flawless as Dr. Bruce's "Polar Exploration," but it is more modern and more personal and will be thoroughly enjoyed both by the scientific and the non-scientific reader. It will naturally be subordinate to "Problems of Polar Research" and to Gordon Hayes' "Antarctica"; but its usefulness at least for the present generation is assured; and no book of its kind on the Antarctic is so well equipped with illustrations prepared by the author himself and specially chosen to drive home his arguments in vigorous and characteristic fashion.

J. M. WORDIE

MAURICE ZIMMERMANN. **Régions Polaires Australes.** Maps, diagr., ills., bibliogrs. *Géographie Universelle*, Vol. 10, Paris, 1930, pp. 285–351.

All geographers welcome the volumes of the Géographie Universelle, and the volume on Oceania and Antarctica is a valuable contribution to our knowledge of southern regions. The Antarctic portion forms the fourth part of the volume and comprises 67 pages. It is divided into four chapters entitled Antarctic Exploration, The Southern Ocean, The Antarctic Lands, and Regional Studies. In his description of the exploration the author surveys rapidly the early voyages of Cook and the British and American whalers. In regard to the voyage of Dumont d'Urville in 1840 the author is surely wrong in stating that he was the first to sight the continent, for as he himself states Biscoe had charted Enderby Land in 1831. The next paragraphs deal with the half century of neglect and the "great effort of 1897–1905." In 1908 there were three principal objectives, the conquest of the Pole, the corroboration of Wilkes Land, and the relation between the two halves of Antarctica. It is interesting to note that the author believes that the conquest of the South Pole was easier than that of the North Pole. The reviewer considers that the long distances, the absence of food, the crevasses of the glaciers, and the high altitudes (10,000 feet) are greater obstacles than the drifting pack at the North Pole. The value of Mawson's work is duly acknowledged, although it did not definitely decide the reality of many of Wilkes's landfalls. The expeditions of Filchner (1912) and Shackleton (1916) were unsuccessful in exploring the area between East and West Antarctica but greatly increased our knowledge of Weddell Sea. A brief account of Wilkins' flight is given, and the modifications of Amundsen's charts by Byrd's flights are referred to.

The bathymetry of the Southern Ocean is discussed. Three elongated basins surround the Antarctic continent, separated by shallow seas near Kerguelen Island, Macquarie Island, and the South Shetlands. Hence this ocean is truly circumterrestrial and is nearly free from land areas. The movements of sea and air are therefore unusually free; while to the south the Antarctic Continent acts as a meteorological center of cold.

The second section of Chapter 2 deals with subantarctic islands. Here blow the roaring forties, at times raising waves as high as 13 meters. The term "foggy fifties" is new to the reviewer. From his own experience he prefers "furious fifties," for this latitude is near the locus of the centers of the very strong Antarctic cyclones.

Interesting sections follow on the thermal strata in the ocean and on the pack ice. Owing to the stormy weather this never grows so thick or wide as in the Arctic

seas. Its general drift to the west is discussed; and the possible effect on the currents of the straits that Wilkins discovered cutting across West Antarctica is referred to.

The change in ideas as to the continental structure of Antarctica is next discussed. For many years Markham and others believed in an Antarctic archipelago akin to that north of Canada. Zimmermann makes one or two slight errors in this chapter. For instance, Scott "removed" only the eastern portion of Wilkes "land" from the map, while Oates Land was discovered by Pennell (not Shackleton) in February, 1911. Today Antarctica is thought of as a "shield" akin to Africa (and one might add Greenland) with a drowned Andean fold forming an Antarctic archipelago on the American side. It is not yet certain whether an area of lowland or even of ice shelf connects Ross and Weddell seas. The author does not mention Gould's discovery of an extension of the ice shelf near the Pole where Amundsen placed "Carmen Land." This revives the theory (advanced by Gregory, Mawson, and the writer before 1914) that a great syncline, or graben, crosses this shield. Zimmermann suggests from four to five million square miles as the area of the continent.

A useful summary of the geology follows, with a discussion of the importance of Antarctica in regard to world paleogeography. For instance, the evergreen beeches are found almost wholly in the larger areas surrounding the Antarctic, where also their fossil leaves have been found. This sort of evidence supports belief in a lost series of land bridges linking these lands to Antarctica. The bearing of these facts on the Wegener hypothesis is also mentioned. However, when Zimmermann dwells on the present icy condition of Antarctica as supporting Wegener, he does not realize that almost all the paleogeographical data indicate temperate climates in Antarctica right through the geological record (see the reviewer's "Antarctic Adventure and Research," 1930; p. 11 and Chapter 5). The reviewer believes that a third hypothesis is possible. Perhaps the plants migrated southward *into a temperate Antarctic cul de sac* and did not necessarily use Antarctica to reach any other region. This is of course an extension of W. D. Matthew's ideas on mammalian ecology.

Several pages deal with Antarctic climate, and there is a good discussion of the peculiarities of the distribution of pressure.

Regarding the glaciation it is pointed out that its extraordinary amount is due not to any heavy snowfall, or great cold but to the almost complete absence of a summer. The characteristic ice tongues and piedmont ice are described, and a cross section is given of the Ross Ice Shelf based on David's very plausible theory of its composite origin mainly from the outlet glaciers. The reviewer disagrees with the view that the term "barrier" is preferable to "ice shelf." As Scott pointed out, it is the extreme tenuity of an ice shelf compared with its huge area that is its chief characteristic. The word "barrier" involves no concept of "area" whatever and in no way indicates its origin. In these days of aviation it is probably less of a "barrier" than any other type of Antarctic environment.

The last section deals with three large land areas in some detail—Victoria Land, Adélie and Wilkes Land, and the American Antarctic Archipelago, all illustrated with clear maps. The map of Victoria Land might be improved by an indication of the horst character of the East Antarctic Cordillera (cf. Fig. 6, in "Antarctic Adventure and Research"). In this present case (Fig. 69) the scarp is shown *on the plateau side* near the Pole, but not elsewhere, though we have similar data at the head of the Taylor Glacier and near latitude 75° S. Some fine photographs, notably Plate 62 of Mt. Erebus, illustrate this section.

A short section deals with the political problems of Antarctica. The claims of the various nations are stated without any comment, though one would have welcomed the opinions of a French geographer.

GRIFFITH TAYLOR

Dynamic Oceanography

Albert Defant. **Einführung in die Geophysik III: Dynamische Ozeanographie.** x and 222 pp.; maps, diagrs., ills., indexes. (Naturwissenschaftliche Monographien und Lehrbücher, Vol. 9.) Julius Springer, Berlin, 1929. 9½ x 6½ inches. RM. 18.

Recent advancements in dynamic oceanography are intimately connected with the names of V. Bjerknes and V. W. Ekman. Both of these investigators abandoned the field of classical hydrodynamics, dealing with the motion of an ideal fluid which is supposed to be homogeneous, incompressible, and frictionless, because they realized that such an ideal fluid is not met with in nature. Sea water is not homogeneous nor is it incompressible. The density of sea water varies from one place to another according to the temperature and the salt content of the water and the pressure that is exerted upon it. Nor can sea water be regarded as a frictionless fluid. On the contrary, it has a great apparent viscosity because eddies, which are found in every current, transfer water particles from one layer to another and smooth out existing differences in velocity. Laws valid for an ideal fluid cannot be applied to ocean currents.

The methods of Bjerknes and Helland-Hansen have found wide application in oceanography because they allow accurate computations of subsurface currents on the basis of observations of temperatures and salinities, which are much more readily obtained than direct observations of currents. The International Ice Patrol, conducted by the U. S. Coast Guard, for example, has made extensive use of these methods when computing the currents in the vicinity of the Grand Banks of Newfoundland in order to predict the drift of icebergs and has found a good agreement between the predicted and the actual drift of bergs.

Ekman examined the effect of viscosity on the currents, taking the effect of the rotation of the earth into account. His first contribution dealt with currents produced by wind action. He approached this problem on the suggestion of Fridtjof Nansen, who had observed that the direction of the drift of the Arctic ice deviated to the right of the direction of the wind and had reasoned that this circumstance was a combined effect of the apparent viscosity of the water and the rotation of the earth. Ekman's theoretical investigation not only confirmed this conclusion but also brought out the surprising discovery that the wind sets only the upper 100 meters of water in motion and that the average wind current down to this depth is directed at right angles to the direction of the wind—to the right in the northern and to the left in the southern hemisphere.

Bjerknes' method for computing ocean currents and Ekman's theory of wind currents have already been embodied in oceanographic textbooks, but the later contributions of these two investigators were until recently scattered in a number of special papers. This applied to Bjerknes' studies of vortices in a fluid of varying densities and to Ekman's investigations of the influence of the bottom configuration on the course of ocean currents. None of these papers was readily accessible to students of oceanography and the same was true of many other papers inspired by the new viewpoint of Bjerknes and Ekman.

Dr. Defant's new book comes therefore at the time when an urgent need for a compilation of these contributions exists. One might expect that a summary of our present knowledge in dynamic oceanography would appear as a series of fragments, but Defant has succeeded in uniting different results and in giving a continuous presentation of our knowledge of many phases of the motion of the sea from the simplest to the most complicated. His book is therefore much more than a compilation—it is a personal contribution which must be greeted with enthusiasm by all who are interested in oceanography.

The greater part of the book is devoted to a treatment of the fundamental con-

ceptions upon which study of the ocean circulation is based and to their application to practical problems. The theory of wave motion and of tides is dealt with in a summary way because comprehensive treatments of these subjects are found in existing textbooks; however, Defant has included the latest investigations in these fields and thus made them easily accessible to a greater number of readers.

Defant's book is mathematical-physical. Mathematics has been used wherever possible, but Defant has a remarkable faculty of simplifying formulae and arriving at final results by short cuts that have escaped the attention of the original authors. He also understands how to explain the physical significance of every step in the calculation and thus makes his book valuable to the readers to whom mathematical tools do not appeal. He selects striking examples from nature for illustrating the application of abstract computations when interpreting concrete phenomena, and his text is always clear and to the point.

Dr. Defant is to be complimented upon his work, which can be most warmly recommended to every student of oceanography. The reviewer joins in the author's wish at the end of his preface that the book may increase the interest in oceanography.

H. U. SVERDRUP

AGRICULTURAL PRICE TRENDS IN INTERNATIONAL TRADE

M. SERING. **Internationale Preisbewegung und Lage der Landwirtschaft in den aussertropischen Ländern.** xv and 230 pp.; maps, diagrs., index. *Berichte über Landwirtschaft No. 11 (N. S.).* Paul Parey, Berlin, 1929.

The sequence of international events during the middle of the last century has been marked by a struggle among the major powers for the acquisition of colonial lands and their subsequent exploitation. This activity has been accompanied by an industrial revolutionary era and reached a climatic stage with the fighting of the World War and its consequences. It is the author's theory that the historic record of this period is reflected in agricultural price trends. Not that annual *crop* prices reflect the struggle of the times, but that the bringing under cultivation of new lands at a time when the nations were undergoing great industrial changes influenced general agricultural price levels, and these levels serve as significant indices. Since the major world trade movements occur between industrial areas and those producing a surplus of agricultural commodities outside these areas, the price level fluctuations in the latter areas must reflect the industrial situation.

The publication presents in tables and graphical illustrations price movements in the international trade of the principal countries. The data are reduced to a common base and thereby provide for sound comparison.

The treatise is divided into five parts: (1) the era of expansion of grain lands from 1875 to 1900; (2) the end of the era of expansion of grain lands, 1900 to 1914; (3) the international agricultural crisis, 1920–1924; (4) the price movements and the status of farming since the Dawes Plan; (5) the causes of the abnormal prices for the world's major agricultural products.

The author's searching inquiry contains too many elements of interest to warrant a sweeping generalization of his arguments. For those interested either in the purely economic aspects of world relations between agricultural production and the movement of industrial goods or in the purely geographic phases of world trade there is much good material here.

Valuable tables of production, trade, and price fluctuations are included in the appendix. Maps and graphs in colors based upon some of the data are supplied as loose inserts and hence may be laid side by side for comparative reading.

EUGENE VAN CLEEF

Camel Transport in the United States

Lewis Burt Lesley, edit. **Uncle Sam's Camels: The Journal of May Humphreys Stacey, Supplemented by the Report of Edward Fitzgerald Beale (1857–1858).** 298 pp.; map, ills., bibliogr., index. Harvard University Press, Cambridge, 1929. $4.00. 10 x 7 inches.

As a step in the opening up of the Southwest the story of the introduction of camels as a means of transportation and for military purposes to combat the Indians is not without interest. During the late fifties of the last century a number of these animals were purchased by the United States Government and brought to Texas. They were tried out by Edward F. Beale on his expedition to survey a wagon road from Fort Defiance to the Colorado River in 1857–1858. His journal, together with the previously unpublished journal of May Humphreys Stacey who accompanied him, are here brought together and issued with additional chapters by the editor. Together they give a vivid account of a journey through Texas, New Mexico, and Arizona to California in 1857–1858. Beale, finding the camels very satisfactory and admirably suited to the country, writes that he looks "forward to the day when every mail route across the continent will be conducted and worked altogether with this economical and noble brute." However, they proved unpopular and in 1864 were sold at auction by the Government. The editor has also written on "The Purchase and Importation of Camels by the United States Government, 1855–1857" (*Southwestern Hist. Quart.*, Vol. 33, 1929, pp. 18–33), and William S. Lewis has told the story of "The Camel Pack Trains in the Mining Camps of the West" (*Washington Hist. Quart.*, Vol. 19, 1928, pp. 271–284).

New Light on Torres' Voyage

Henry N. Stevens, edit. **New Light on the Discovery of Australia as Revealed by the Journal of Captain Don Diego de Prado y Tovar.** xii and 261 pp.; maps, MS facsimiles, index. London, Henry Stevens, Son & Stiles, 1930. 18s. 9 x 6 inches.

In 1605 Quiros sailed from Callao on a voyage of discovery in the South Seas in search for the fabulous Southern Continent. The island of Espiritu Santo (in the New Hebrides) was finally reached, whence two of Quiros' lieutenants, Torres and Prado, were sent on to Manila, Quiros himself returning to South America. Torres and Prado proceeded to the Philippines around the south side of New Guinea, discovering and passing through the strait that now bears Torres' name, although they could hardly have been aware of its true character.

Prior to the publication of the volume under review what little had been known of Torres' voyage was based on a brief letter of Torres to Philip III of Spain. Mr. Stevens has had the great good fortune of discovering a holograph account by Prado which sheds new light on the work of Quiros and the subsequent voyage to Manila. The Spanish texts of Prado's narrative, or "Relación," and of Torres' "Letter" are here printed with English translations by Mr. G. F. Barwick of the British Museum and with an extended introduction by the editor.

Prado's narrative gives an entertaining account of shoals, storms, and tidal currents encountered, of skirmishes with the "Indians," and of strange animals, birds, and plants. The topographical details are confusing. In the Introduction Mr. Stevens tries to reconstruct the route through the straits and to show that the Australian mainland was sighted. He argues that Prado, not Torres, was in supreme command and that to the former, therefore, belongs the credit for the "discovery" of Australia. Students of this voyage, however, would do well to consider a critical review of the volume in the London *Times Literary Supplement* for May 22, 1930, in which these points are controverted.